A Century Of Tuberculosis in the Isle of Lewis in the Western Isles

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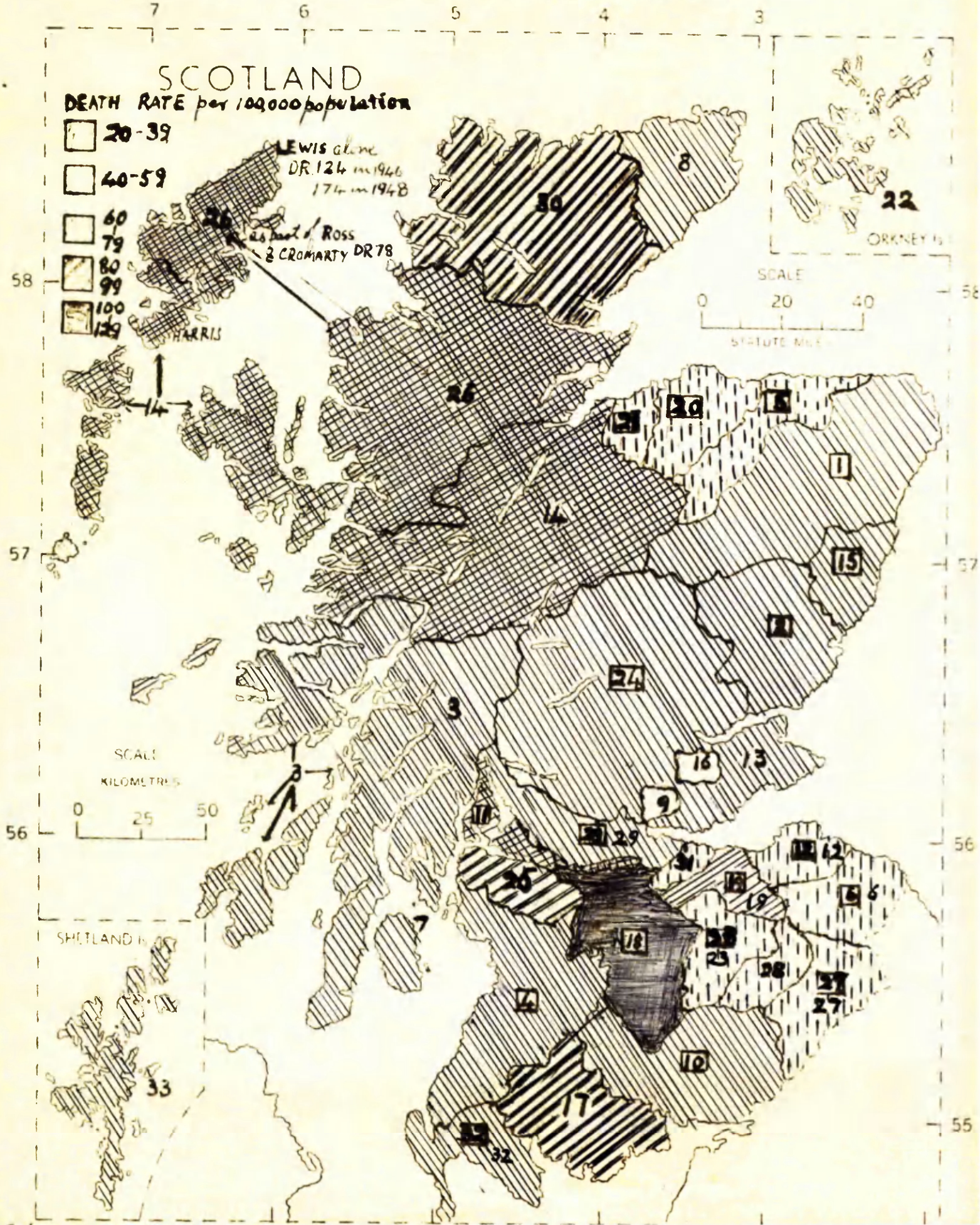
FIG 4 MORTALITY FROM TUBERCULOSIS (ALL FORMS) in SCOTLAND BY COUNTIES 1946 From WHO



The Edinburgh Geographical Institute

Scale : Tenth Inch to the Mile

0 2 4 6 8 10 Miles

Key to fig. 4

Key number	County	Death rate per 100,000 population	Key number	County	Death rate per 100,000 population
1	Aberdeen	44.8	18	Lanark	120.1
2	Angus	74.0	19	Midlothian	69.7
3	Argyll	46.1	20	Moray	39.1
4	Ayr	56.2	21	Nairn	34 .8
5	Banff	37.6	22	Orkney	51.2
6	Berwick	24.1	23	Peebles	34.7
7	Bute	43.0	24	Perth	43.7
8	Caithness	56.4	25	Renfrew	89.6
9	Clackmannan	55.4	26	Ross & Cromarty	78.2
10	Dumfries	58.2	27	Roxburgh	31.5
11	Dunbarton	71.4	28	Selkirk	33.3
12	East Lothian	24.9	29	Stirling	46.2
13	Fife	52.1	30	Sutherland	99.8
14	Inverness	66.4	31	West Lothian	32.9
15	Kincardine	51.2	32	Wigtown	55.1
16	Kinross	39.7	33.	Zetland	42.2
17	Kirkcudbright	81.1			

Figure 4 serves two purposes - (1) to show the geographical position of the Isle of Lewis; (2) to bring out the totally false impression which is gained by looking for the tuberculosis statistics in the comprehensive figures for the County of Ross & Cromarty.

Thus for 1946 the death rate for Ross & Cromarty is given as 78.2 but the Lewis rate was 124 per 100,000 and rose to 174 in 1948.

Table of Contents Part 1

INTRODUCTION

After about 35 years in Lewis I know the Lews and its people very well. I find the Island a very pleasant place to live in and the people I esteem worthy of my admiration. The manner in which they met and endured the terrible onslaught of tuberculosis aroused my sympathy. To help them in their tragically heartrending circumstances became my chief objective. Now that the battle has been won, I feel the history of the disease in the Island ought to be recorded, hence this Thesis. It seemed to me that it would be very difficult for another to undertake the work; because Lewis is not a political entity, and the records of the disease are not to be found in the Registrar General's Reports, at least not a continuous record. With the kindly and valuable help of the local Registrars I was enabled to go through the Death Registers in their Registry Offices. From the Death Registers I obtained the basic information which enabled me to follow the course of the epidemic and this is described from beginning to end in the Thesis.

As I consider the type of house - the "black house" or "tigh dubh" - the most important factor in furthering the rapid spread of the disease, once the casual organism had been brought to the Island, I have included photographs of these dwellings to make clearer my written description. They have almost completely disappeared now. Another interesting picture is that of Soval Lodge, in the Parish of Lochs, as it is possibly here that the first case in this Parish occurred, brought by a person from the Mainland.

Numerous tables and charts to present, in visual form, the course of the epidemic have been prepared. A full list of these is given after the Table of Contents, and one chart of the respiratory and non-respiratory death rate is placed here in the Introduction as it gives a general idea of the rise and decline of the epidemic wave. As the disease is of late introduction to Lewis, an area of virgin soil for the tubercle bacillus, we get the typical form of attack among the younger people, especially young males, and for comparison I have copied charts from Brownlee's Monograph of regions of Britain attacked much earlier. In those for Scotland

and North Wales, the onslaught on those aged 20 to 25 is noticed to be heavy, but, by the first decade of the present century, the young men were being affected about equally with men of 40 to 45 years. In the chart for England and Wales, on the other hand, by 1900 to 1910 it is those of 50 who are more severely affected. In the case of Ireland there was little change.

The details of a Lewis Survey and the results, in so far as they relate to school children, are given, (more use of the data collected in the Survey may be made use of later.)

The value of B.C.G. vaccination at an early age is made abundantly clear.

The pattern followed by the Lewis mortality curve is similar to that of the other areas of the United Kingdom, so it would seem that in Britain a tuberculous epedèmic runs a typical course.

ACKNOWLEDGEMENT

The Registrars, to whom my thanks are due, are Mr. James Rodger, Stornoway Parish; the late Mr. Alexander Morrison, Barvas Parish; the late Mrs. Macleod, Lochs Parish; the late Mrs. Maciver, East Uig, and Mr. I. Macdonald, West Uig.

To Dr. J. Landess Horne, County Medical Officer of Health, I express my sincere thanks for the way in which he backed everything I undertook and continually pressed forward the need for all the facilities and financial assistance necessary to undertake treatment or preventive measures.

To N.A.P.T. (now Chest and Heart Association), through Dr. Harley Williams, (one time M.O.H. in Lewis), my thanks are due for the excellent help which it gave in the field of education of the Public and Island Doctors by sending experts in the different branches of tuberculosis. To Dr. Harley Williams, in his private capacity, I must express my grateful appreciation of his kindness in giving me the benefit of his expert and experienced counsel in many matters, in addition to that of reading and commenting on the Thesis. To Drs. A. Goldberg and A. Lees of Glasgow, I owe a heavy debt for their ever ready advice, kindness, helpful suggestions and criticism of my work. In St. Andrew's House, I received all the help I

sought from Dr. Ian MacGregor and Mr. Robertson, Statistical Officer; between them they prepared many useful tables which I give in the Thesis.

The tedious task of typing out the script with the frequent and numerous changes therein, was kindly undertaken by Miss M. Macsween helped by Miss Ishbel Macleod. Mr. William Morrison, Principal Teacher of English, obligingly corrected any errors in English. The compilation of some charts, Table of Contents and references was ably done by sixth-form pupils, the Misses A.M. Macdonald, C.M. Matheson, C.A. Smith and M. Smith. Mr. Ian Morrison, Principal Teacher of Commerce, at short notice, obligingly typed the final Thesis. To all of these I offer my appreciation and thanks.

A CENTURY OF TUBERCULOSIS IN LEWIS

Medical literature and non-medical books are alike emphatic on the rarity with which tuberculosis was encountered in Lewis before the middle of the nineteenth century.

One of the main purposes of this thesis is to describe an epidemic of tuberculosis which struck an intelligent race of people living under primitive conditions while it was still non-tuberculinised. We are enabled to see the beginning and the end of the epidemic, which lasted one hundred years, and which ran its natural course. As tuberculosis is a social disease it is necessary to look at the people from the socio-economic angle reviewing their housing, their diet, the medical and nursing facilities, if such existed, and their general attitude to the disease. We will find that throughout almost the whole course of the pestilence the various factors commonly held to play major roles in the epidemiology of tuberculosis remain nearly constant; the only one varying being the tuberculinisation of the people, and this it is hoped will be shown to be the paramount factor in controlling the disease.

GEOGRAPHY

As the island which was geographically remote had a population which stayed put and grew, while it still retained the original primitive type of dwelling, an excellent opportunity to study the natural course of a tuberculosis epidemic appeared to present itself. The society here was strictly of one class, non-stratified, and one and all were housed alike and fed alike. This epidemic lasted a century and ran three-quarters of its course uninfluenced by medical effort and we are thus enabled to witness to a maximum extent the natural spread and advance of tuberculosis in a closed community, and to observe its spontaneous regression.

The Isle of Lewis is the insular part of the County of Ross and Cromarty and, with Harris, an insular part of Inverness-shire, forms the Long Island. The Long Island is the Northern part of the Outer Hebrides and lies off the North West Coast of Scotland from which it is separated by the Minch. Lewis is the northern portion of the Long Island and is 825 square miles in area, while Harris, comprising the southern quarter, extends to 193 square miles. Harris is much more mountainous and rugged than Lewis which, apart from the

rugged heights of the southern part adjoining Harris, is a vast peat bog. The underlying rock is Archaen or Lewisian gneiss said to be the oldest rock formation in Europe.

There is but one town in Lewis - Stornoway which, because it has an excellent natural harbour and is well sheltered, has been well developed as a port. It is on the East Coast of Lewis and its population has grown steadily from 1,300 to 5,229 between the 1841 and 1961 census returns. The other inhabited townships, villages or hamlets are all situated around the coastal belt. Since Stornoway is the only port for the island all goods of whatever kind must be shipped there. The Hospital and the Sanatorium are in the town and there is a large airport in the vicinity.

Kyle of Lochalsh on the mainland part of Ross-shire is the rail head and is 70 miles from Stornoway. The mail boat, which sails daily except Sundays, takes 4½ hours to cross the Minch. From Glasgow, Edinburgh or Aberdeen the travelling time is about 14 hours by rail and steamer. By aeroplane this time is reduced to 1½ hours and there is a daily service. It was only in 1924 that a daily service across the Minch was established all the year round; before that, the mail boat ran on six days weekly in summer and three in winter.

On the map Lewis is pear shaped with its apex at the North terminating at the Butt of Lewis in jagged rocks on which stands the Butt Lighthouse shining out over the Atlantic to the West and over the Minch to the East. This is the flat arable Ness area of the Parish of Barvas and is thickly populated by those of Norse descent. The west coast from the Butt to Barvas has villages almost all its 20 miles and is regular. At one village - Galson, in the sandy cliffs "kitchen middens" have been exposed by the elements, and I have uncovered from their enclosing burial stones complete skeletons many thousands of years old. From Barvas there is a road running 12 miles across the peat bog to Stornoway. There is neither habitation nor cultivated land on this bleak 12 mile stretch till one reaches the water works for the Town. The east or Minch coast from the Butt to Stornoway is as regular as that of the Atlantic or west, and is little indented except for a large bight - Broad Bay. There is no road from Ness till one reaches North Tolsta in the Parish of Stornoway from where there is a good road 15 miles long through townships on arable land to Stornoway. This road is on the west side of Broad Bay to

LAZY BEDS

↑
still cultivated
long since derelict
↓

Stornoway from there a good road runs along the east side of Broad Bay for 14 miles to the tip of the Eye Peninsula, Tiumpan Head Lighthouse. The Peninsula is thickly populated and, with the villages already alluded to on the western side of Broad Bay, comprise the landward part of Stornoway Parish.

From Barvas village the Atlantic Coast road runs south west for 12 miles through populous districts to Carloway township in the Parish of Uig. The coastline is exposed but not much broken, but after Carloway it becomes much cut up by Loch Roag with its numerous off-sets and enclosing many islets - the largest being Bernera with over 500 people. From Breasclete and Callanish with the renowned Callanish Standing Stones 4,000 years old, second, if that, to Stonehenge, the road skirts the winding loch borders without habitation to its terminus in upper Uig. Here the land is arable and good for stock raising. There are beaches of yellow and white sands extending for miles, while inland are hills up to 1,200 feet. We have reached the base of the gear and, therefore, the widest part of Lewis about 25 miles across. The roadend here is 40 miles south of Stornoway and 75 miles from the Butt - 40 as the crow flies.

To reach the south tip of Lewis on the Minch coast we would have to walk 25 miles over mountain, lochs and bog and cross a sea loch as that is the width of the base. This trip would land us in the Park deer forest of the Parish of Lochs. Once again we are in the hilly area with peaks up to 1,300 feet. Close by we would have passed the Clisham in Harris, 2,622 feet. From this point there is no road to Stornoway or indeed anywhere. The coastline from here to Stornoway is much cut into by long fiords: Loch Seaforth, 15 miles long; Loch Erisort, 10 miles long; Loch Leurbost, 5 miles long and many others.

Because of the shallowness of the soil overlying hard non-porous rock, the crofters found it necessary to dig trenches for drainage and the soil so removed was piled up to form deeper beds suitable for the cultivation of potatoes and corn. These were the "lazy beds" and correspond to the terracing found in other hilly regions of the world but differ from the terraces in that they run in line with the slope of the hill instead of at right angles to the hillside. In very rocky places the "lazy beds" might not exceed a moderate-sized room in a house in extent.

This area of South Park is uninhabited, although from the "lazy bed" formations it is evident that it did support human beings in the not too distant past. On the way across country from Uig we would come on the Lewis-Harris road at Loch Seaforth and if, instead of crossing in to Park, we had turned north on this road we would have come near to the head of Loch Seaforth and habitation at Arivruaich. A little further on Balallan village is reached at the head of Loch Erisort. On the south side of this loch is a road - just opened before my arrival in 1930 - to South Lochs which was once well populated. Innumerable lazy beds are there as evidence. Balallan stretches along the north shore of Loch Erisort for over 2 miles. Inland, that is on the west side of Balallan, right across to Uig, are countless lochs and lochans, peat bogs and plenty of bare rocks. There is little in the way of arable ground in the Parish of Lochs - North or South - but there are crofts and sheep are reared. Fishing was the mainstay here but it has been replaced by sheep rearing, weaving and the raising of beef cattle. Passing from Balallan northwards, we reach Loch Lourbost at its head and a branch road runs in to several villages situated on or near the north shore. This is still a populous and busy area with tweed making and fishing. We need not go through any more villages after Balallan as the main road to Stornoway, 15 miles distant, carries on across the peat bog and by-passes the villages situated along the shores of the sea lochs.

Just about the Burgh Boundary, this Stornoway-Harris road joins the Barvas road but, before doing so, is itself joined by a cross-country road from Uig and the one from the Butt to Carloway and Breasclete and Callanish. It is impossible to circle the island by road without retracing one's tracks from Uig and the Butt. All habitation is beside the sea - food was here in abundance - and the land bordering the sea had shell sand blown over it which neutralised the acid peat. In addition, the plentiful supplies of laminaria tangle on the beaches provided good manure. Naturally, people settled along these arable stretches. Lewisian gneiss does not weather readily and, when weathered, does not make very good soil, so that the crops grown are simple and few. Potatoes, barley, corn, greens such as cabbage and kale and roots like carrot and turnip are grown. Milk cows, of which every crofter in the

past had two or more, are steadily becoming rarer. Milk is imported from the Milk Marketing Board and goes all over the island. Many crofts stand derelict. But there are reseeding schemes in action now and the peat bogs in many parts are bringing forth good grass and supporting beef stock.

CLIMATE

The climate is the result of certain geographical factors. Lewis, lying in latitude 58° 30' north and longitude 7° 10' west, is well out in the north Atlantic and so should be cold, wet and stormy. It is stormy and wet, but the total annual rainfall is not great - about 45 inches. The humidity arises from the infrequency of a really dry 24 hour stretch - showers are plentiful. The presence of the Gulf Stream, which passes close by, keeps the temperature higher than the latitude would suggest. Like the outermost parts of western Britain, Lewis is subject to frequent gales and these occur in summer as well as in winter. Records of sunshine are highest in the spring, but from March to August they show that Lewis gets about one third of the possible. On the average frost is late in coming and is even then not severe; snow is rare and when it comes it is quickly displaced by a rise in temperature or by rain. As an indication of the prolonged autumn, I would mention that strawberries will yield fruit till November. The summers are not warm. A temperature over 65°F. is a rare thing and the average for July is 61°F. Fog is almost unknown but occasionally there arises a mist if the day has been hotand then a sudden, cold wind from the north comes to the Island. This happens more often at the Butt, where warm and cold currents meet.

HISTORY

A brief sketch of the history of the Island is proper as antecedent circumstances have had an important bearing on the subject matter of this thesis.

The kitchen middens at Galson are evidence of pre-historic occupation of the Island, while the fine circle of Standing Stones at Callanish and the Broch at Doune Carloway speak of the Picts. The Norse were the next race to occupy the Island after they had completely subjugated the natives. We find proof of this in the place names, personal names and ethnology. The domination ended with the Battle of Largs in 1263. The Celts became the ruling people

and Gaelic replaced Norse. But in the Ness area the people are typically Norse and Dr. John Beddoes describes the Stornowegians as predominantly Norse. In the area of the "kitchen middens" he finds "the short, thick-set, snub-nosed, dark-haired, often even dark-eyed race, probably aboriginal and possibly Finnish." (The Races of Britain.)

About 1932 I sent to the Scottish Society of Antiquaries specimens of human bones, animal bones and needles made from fish bones which I had uncovered in the "kitchen middens". The Secretary of the Society came to Lewis and we took up a complete human skeleton which I sent to Edinburgh. Following examination, I received from the Secretary a copy of a report on the facial bones which were considered to be of mongoloid or esquimau type.

As Lewis was believed to have valuable minerals in its soil James VI granted a charter to exploit the Island to the Fife Adventurers - a Company of Gentlemen, in 1598. These Adventurers failed in three attempts to take possession of the Lews and disposed of their title to Kenneth Mackenzie, Lord Kintail or Earl of Seaforth. The Seaforths exerted their influence in recruiting: Lewis became a nursery for soldiers, Lewismen accounted for 802 of one battalion of Ross-shire Militia and, in 1901, 2,500 were under training in the Royal Naval Reserve for which Stornoway was a training centre.

The Mackenzies of Seaforth did much to develop the port and lay the foundations of the future Stornoway. The interior of the Lews, because of lack of roads, did not receive much attention but Stornoway grew and became a Burgh of Barony and, with the coming and going of ships, took on a mercantile and mainland character. As the only port it stood apart. It was here that the fish merchants lived, but the fishers they employed lived in the villages around the shores of the lochs.

Lewis was less affected than other parts of the Highlands by the upheavals of the eighteenth and nineteenth centuries; the "Clearances" did not drive the people away and lead to emigration though, in the Park area of South Lochs and also in West Uig, there were some evictions.

Dr. Webster's estimated population of 6,386 persons in 1755 rose to 9,168 by the 1801 Census. This multiplication of inhabitants continued right on till 1911 when a peak 29,603 persons was reached. In the Highlands, Lewis was almost unique in this respect because, apart from Barra, other districts had

reached and passed their maximum in 1841.

Small boats fished herring in the Minch and the sea lochs Erisort, Seaforth, Leurbost and Loch Roag, but, in 1810, the annual shoals diminished to near vanishing point. In Loch Roag lobster catching replaced herring fishing. White fish were also taken and, after drying, were exported.

Kelp burning was quite a valuable trade but it collapsed in 1840. A combination of potato blight and a drop in cattle prices at this time meant hardship for many. This was made worse by the natural increase in population.

In 1844, Sir James Matheson purchased Lewis. He had become wealthy from the China trade and he decided to help improve the social conditions in Lewis by reforming agriculture, improving stock and draining the land. Road making and school building and the erection of fish curing sheds were among his schemes. To reduce the overcrowding, he encouraged emigration and 2,000 persons accepted his offer of assisted passages to Canada. He spent £574,363 during his lifetime in his endeavours to rehabilitate Lewis.

A Commission, under Sir John McNeill, in 1851[2] looking into the social and economic state of Lewis advocated emigration as the solution to the wretched conditions then existing and forecast distress and famine if this was not done. The unexpected finding of shoals of herring all around the Island upset his calculations and Stornoway and Lewis became hives of industry and prosperity; as many as 1,400 boats were to be seen in Stornoway harbour at one time.

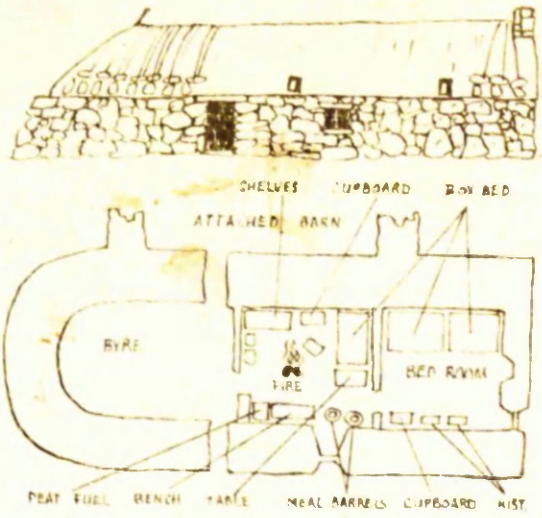
It is important to note this influx of boats with crews from mainland ports where tuberculosis was prevalent at that time. Also women from neighbouring townships flocked to Stornoway to work with the curing crews, and accommodation was not available except under the worst possible conditions of overcrowding and lack of sanitation.

This great prosperity was offset in rural Lewis by the rising population, and subdivision of the crofts and squatting on common land, unaccompanied by an increase in agricultural production. Matheson died in 1878 and his public works dwindled; while a change in the method of payment of fishermen meant that their earnings were reduced. Another Commission, the Napier Commission,[3] was held in 1883 and again the conclusion was reached that hardship, where it existed, was caused by overcrowding. The population now was in the region of 26,000 persons.

pre 1870 BLACK HOUSE ARNOL.
To be preserved as a Museum.

PEAT STACK

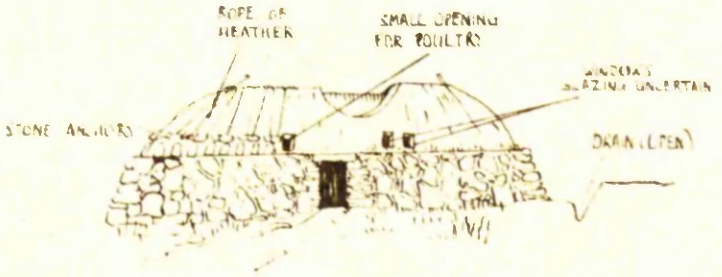
END VIEW.



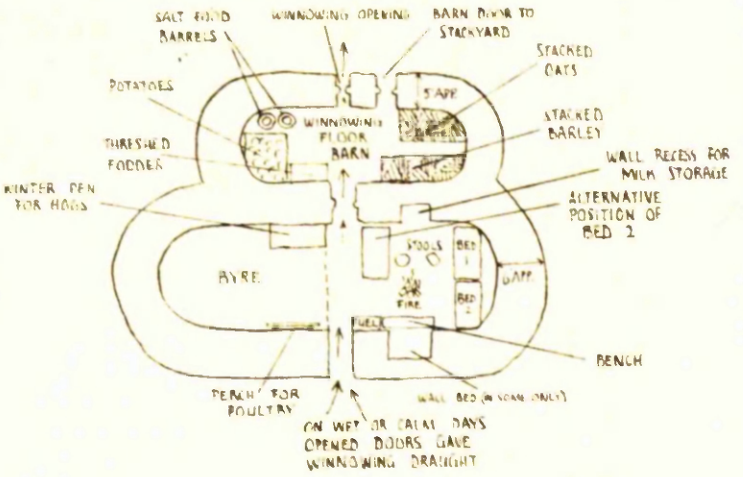
IMPROVED TYPE BLACK HOUSE ISLE OF LEWIS, 1870-1914

BLACK HOUSE WEST LEWIS PRE 1870

WALLS UNDRESSED LOOSE BOULDERS. THATCH BARLEY STRAW, HEATHER AND RUSHES



BLACK HOUSE WEST LEWIS (PRE 1870) FLOOR PLAN



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BLACK HOUSE BORVE
pre 1870

SIDE VIEW

END VIEW

The Napier Commission found that much hardship was prevalent, that housing was shocking and that poor agriculture on tiny holdings with inadequate yields was having dire effects. Another of its conclusions was that long dependence on charity had led to apathy and to some demoralisation. Because of the low valuation of crofts little was raised from the rates and, as this money was devoted wholly to Poor Law relief the rates could not bear the loan burden.

Once again emigration was declared to be the only hope. Some voluntary emigration took place, but the schemes sponsored by the Government in 1888 and again in 1906 did not succeed; the Lewisman did not wish to leave his native soil. At the beginning of the twentieth century further blows came from steam drifters from the mainland ports ousting the Lewis sailing boats searching for herring and steam trawlers swept the inshore fishermen off the grounds. However, after the first decade of this century Stornoway again boomed with large herring catches and trade with Germany and Russia meant prosperity. The advent of the war stopped the boom and, when peace came, the continental trade was never recaptured.

After the war, Lord Leverhulme bought the Island and sought to utilise the natural advantage of the situation in the Atlantic and Minch fishing grounds. He meant to industrialise the town of Stornoway and build factories for fish canning and food for the townspeople was to be produced in the rural districts. However, these far-reaching plans did not succeed.

But people were no longer content with a subsistence economy and, with the collapse of all white fishing and with dwindling herring catches, emigration appeared to many thousands of young men as a way of escape and, in 1921, 1,200 sailed from Stornoway to Canada. In 1923 they were followed by another 1,000.

DESCRIPTION OF THE DWELLINGS

From time immemorial till well into the twentieth century there was but one type of house - the "black house" - and this changed but little; originally it consisted of one apartment with the fire on the floor in the middle of the room and no chimney. This one apartment held livestock as well as human beings. After 1875, an open fireplace with a chimney was constructed in one of the end walls. As the "black house" played a central part in the spread of tuberculosis a description of it is called for.

When I came to Lewis in 1930 there were still many "black houses" mostly of the chimneyed type although the older form still existed, and some were lived in as recently as the 50's. The post 1875 type still exists, modernised, and lit by electric light.

I arrived in December, 1930, in the evening at Stornoway and, to my amazement, there were crowds of people on the quay awaiting the arrival of the "Loch Ness", the mail boat, which would again set sail at midnight across the Minch with passengers and goods for the mainland. The people were awaiting the arrival of friends or seeing relatives off two or three hours later or perhaps doing both. The next surprise was to see so many motor vehicles of all shapes and sizes, from home-made model T Ford buses to old battered cars. Country travellers all had relatives living in town and they would spend the day with them then gather on the quay for the event of the day - to see who arrived and who left, and to exchange news of village or Stornoway or Glasgow, Edinburgh, or Aberdeen. This was a feature of Stornoway which intrigued every newcomer.

Stornoway was quite a pleasant town and though there were narrow streets of tumble-down houses at the harbour, the main thoroughfares, Cromwell Street, South Beach Street and Matheson Road were better with the houses in decent repair. There were numerous shops; the whole Island came here to do its shopping.

A day or two after my arrival I received a request from the Department of Health to visit a girl in the Ness district of Barvas who was suffering from acute, severe pulmonary tuberculosis and to offer her accommodation in the Sanatorium. The object was to isolate her because she lived in a poor "black house" and there were several members in the family. I was told she herself was unlikely to benefit much by removal.

It was a wet and blustery day when I set off by car to see this girl - my first visit to a Lewis patient and my first trip out of Stornoway. As indicated before and as seen from the map, Ness is on the opposite side of the Island from Stornoway and to get there means crossing to the West or Atlantic Coast. The road rises from near sea level through the almost continuous and adjoining townships of Laxdale and New Market past the site of the present water works. The road, which was fairly wide, was in quite good

condition and, although from the absence of trees, hedges or dykes it was possible to have a wide unobstructed view, it was just one monotonous vista of faded heather on peat and so remained for about ten miles from Stornoway where, from a high point, I saw the Atlantic, a church spire and some buildings. The church and buildings were in Barvas. Half a mile or so from Barvas I had the impression that I had arrived on a first World War battlefield scarred with shell craters, furrowed with trenches, (these "trenches" were the cuttings in the peat beds), and littered with the stones of flattened buildings. Among the stones were low-lying rectangular structures with rounded thatched tops. These unusual protuberances from the ground turned out to be "black houses" actually the inhabited dwellings of the people. I had never seen anything like them and they bore no resemblance to any human habitation I had ever seen.

They stood in irregular arrangement in water logged areas just off the road and to reach them one had to look for stepping stones to avoid sinking up to the ankles in mud. Around the entrance the ground was churned up by the sheep and cows which also occupied the abode. On some the thatch was new and golden but on others grey with strong tufts of grass growing here and there among the straw. Quite often a hen would be on the dome pecking at corn or insect; less frequently a lamb would be seen walking round the extended ledge which was part of the structure, (see later.)

As I descended towards Barvas the wind from the Atlantic blew across the thatched structure towards me and I smelt something then new to me; the pleasant smell of much diluted peat reek. With smoke coming through the open door, and wisps swirling all over and around the thatch, it looked as though the place was on fire.

As I drove northwards I passed villages where a majority of the dwellings were of the type described, but there were also new settlements on farms which had been broken up to make crofts for land-hungry war veterans. The houses on these new crofts were modern dwellings more in keeping with general experience. In the Ness district, which was composed of many villages all joined together along the main road and extending for about six miles, almost all the houses were of modern construction and "black houses" were infrequent. However, the house in which the patient lived was a black house in an area

with many more.

I knocked on the door. It was opened by a young man and when I explained the purpose of my call he said he would speak to the parents and went into the house again. He reappeared in a minute or two and told me his parents did not wish me to come in. As I was new to the locality I asked questions about the Butt Lighthouse and so on whereupon his father appeared at the door and said to me "Go!" I had travelled over 30 miles in a gale but I did not see the inside of a black house on this occasion.

The black house was, in fact, a very simple abode constructed of local materials, flat stones and driftwood or spars from old ships, and straw from oats or barley for thatching. There were no trees on the island for timber. The stones were flat slabs 15 to 18 inches wide, split from the rock by heat from a peat fire and these were laid one on top of the other till they rose to about 5 feet like a dry-stone dyke. This wall was duplicated and soil was packed between the two giving the house a wall 3 to 4 feet thick in all. A rectangular enclosure was thus formed with but one break on the leeward side where the door would be and the ground inside this was pounded firm to make the floor of the house. The roof rested on top of the broad wall leaving a wide space right round and it was here that a sheep could sometimes be seen walking round nibbling the grass that might be growing on the earth between the walls or among the thatch of a neglected, although occupied house. The driftwood spars, one end resting on the inner wall, were inclined upwards and inwards to be lashed to a longitudinal spar; cross ties held these firmly in position. Over the outside was placed the barley or oat straw thatch and it was given a rounded hump-backed formation. To hold this in position, heavy stones on the ledge all round were connected by rope right over the top and a piece of old fishing net might first be laid over the straw. The ends of the dome roof were not square but curved, thus there were no angles or projections to be caught by gale-force wind and torn off. Originally there was no chimney, only a hole in the roof right above the peat fire which burned in the middle of the room on the earthen floor. The fire burned day and night from January to December. This was necessary on account of the humid climate. The smoke got out through the thatch, soot adhered to it and the roof was stripped to its cabers each year and used as manure. It was excellent and

produced fine crops. The length of the house varied according to the number of occupants, from 20 to 40 feet. Ten feet of this was a byre and the remainder a one or two apartment space for the human beings. If of two apartments, one served as kitchen, bedroom, living-room and dining-room, and the other as sleeping quarters.

There were no opening windows, only a small pane of glass about a foot square put into the thatch on one side of the house admitted light. The darkness inside can readily be imagined when it is realised that this light was diffused over 1,000 to 2,000 cubic feet. Likewise ventilation in the ordinary understanding of the word was nil; hot air and smoke moved out through the interstices in the thatch and cold air came in at any point in a similar fashion or through the mostly open door.

The most incomprehensible feature about the black houses was their siting. No thought seems to have been given to this. I have seen them sitting on a bog surrounded by pools of water and slops thrown into a carelessly constructed open drain painfully struggling to seep away. Approaching many a house in rainy weather meant getting the feet wet and muddy despite the greatest care. What it must have been like getting from one house to another on a dark blustery winter night is outwith the experience of the present generation.

The door, on the opposite side from the prevailing wind, was recessed because of the thick walls and it almost always stood ajar with peat smoke escaping. On pushing the door wide open, one looked into a dark pit and saw little, not only on account of the absence of light, but also because of the lachrymation occasioned by the irritation of the concentrated reek. When the eyes became accommodated, it was noticed that it was not a house one was entering but a byre in which might be a cow, some sheep and hens. There was but one roof to the whole structure and but one entrance.

In the improved type of black house immediately to the right of this outer door was another door, built in a wooden or stone dividing partition separating the byre from the dwelling quarters. The partition did not reach the thatch so that smoke and fire glow were noticeable in the byre. Through this inner door one saw a fire in the middle of the floor which, if burning brightly, gave light. Where the dividing partition was of stone a chimney might be built and the fire burned beneath it on the ground. This was living-room, kitchen

and bedroom; along one side might be two or three box beds - not entirely structurally enclosed but curtained off. A long bench against the opposite wall, a simple stool and a chair or two completed the furniture. Cooking utensils were absent because there was nothing but the open fire so boiling, stewing and baking on a griddle were the only methods open to the housewife. Beyond and through another dividing wall might be a bedroom with box beds and chests in which clothes were stored. Because the rain drained from the thatch into the soil between the walls the dwelling was always damp.

In 1830, Seaforth issued regulations to the effect that (1) a partition must be erected to separate humans and cattle; (2) seaparate sleeping quarters were to be constructed for men and women.

Water was drawn from a well situated somewhere on the croft. Analysis of the supply never came anywhere near the recognised standard of purity. This is readily understood when it is remembered that the source was on cultivated land, or land over which the domestic animals roamed. The fouled water from washing was, in too many cases, simply poured into a shallow trench just outside the house and percolated everywhere if there was an obstruction to free flow to an open ditch. The byre where the dung was stored the year round was emptied in the Spring for spreading on the croft. As human excreta was included, it was at this time that the seasonal outbreak of enteric and diphtheria occurred. "Dung fever" was the name applied to the pestilence in the past and it claimed many victims.

From the above description it will be readily seen that living conditions in the Lews were very primitive half a century ago and, outside the Town of Stornoway and neighbourhood, there still existed many such houses when I arrived in 1930. The Island was isolated, each village was isolated one from the other and I have met scores of people who had never left their home hamlet. Those engaged in the fishing trade or those not obliged to travel south scarcely ever moved. A century ago there were no roads between the townships and communication was by sea, especially between Stornoway and Lochs Parish.

From the Statistical Account, Vol.XIX 1797, we learn that there were only 4 miles of road through very deep moss from Stornoway towards Barvas. It was begun in 1791. Fifty years later the total length of roads was 45 miles - an average of one mile per annum.

On acquiring the Island in 1844, Matheson employed redundant crofter fishermen in road making to relieve distress. When he died, in 1878, there were over 200 miles of roads on which he had spent £25,593.

In 1930 there were fairly good roads but the modest public transport did not permit of going from one township to another and returning the same day and fares were high.

THE POPULATION

There are four Parishes in Lewis. The most populous is the Parish of Stornoway which includes the Burgh of Stornoway and thus the Parish is divided for political purposes into Stornoway Burgh and Stornoway Landward. The Burgh is naturally the Town round the harbour while the Landward part comprises the Eye Peninsula, with townships on the Minch side and others on the Broad Bay side and all the villages on the West shore of Broad Bay right to North Tolsta.

While the Burgh has grown the Landward section has diminished but little, although there has been a drift of people from the more distant tip of the Eye Peninsula and North Tolsta to nearer the Town, where the tweed mills, banks, offices, shops, motor traders and repair shops are found. The only senior secondary school - Nicolson Institute - with 1,400 pupils, (primary and secondary) and hostels for the pupils from the country schools are also here. So too is the Lewis Hospital with resident registrars and house officers, a consultant surgeon, a consultant physician, a gynaecologist and an anaesthetist. Monthly visits are paid by consultants in all the various specialities. Physio and radio-therapy departments are well founded and well run. Pre-nursing classes are held in the Nicolson Institute, and from there the girls go th the Lewis Hospital Nursing School which is affiliated to the Glasgow Royal Infirmary.

The County Hospital - formerly the Sanatorium - is now occupied mostly by geriatric cases. Here are held clinics for chest diseases. The medical staff had been reduced because of the great diminution in tuberculosis cases.

Today, in the Town, there are nine medical practitioners serving 12,659 inhabitants of the Parish of Stornoway.

STATISTICAL ACCOUNT 1797 - STORNOWAY PARISH

The Parish population in 1755 numbered 1,812 and from the Statistical Account, Vol. XIX 1797, we learn that Stornoway held 760 souls and the Parish

2,639. Also we are told that there were 67 well-built houses, slated, commodious and well furnished of 2 storeys high with a garret. North of the Town were miserable thatched huts occupied by fishers, sailors and their families. "There was a peculiar distemper present in this Parish which seized new-born infants about the fifth night after birth and carried them off by convulsive fits." In this we recognise tetanus neonatorum, called in Gaelic "galair nàn coig oiche" which means the Five Night Distemper. In my searches of the four Parishes' Death Registers I noticed many such entries - certified as tetanus neonatorum, uncertified as "Five Night Fever." Rheumatism is the only other condition mentioned under prevalent diseases. Even so, at this period, many people lived to well over 90 years old, as indeed many still do.

In 1792 there were two schools; 129 pupils in one and 40 in the other. The subjects were English, Reading, Writing, Arithmetic, Geography, Latin, Navigation and Book-keeping. In the same year, in the Parish, there were 70 male and 65 female baptisms; 20 marriages and 20 burials. There was a Custom House with a King's cutter to check smuggling. The Post Office was established in 1759 and, as business was increasing, by 1797 a new packet boat was built, and sailed once a week instead of fortnightly. The incoming and outgoing mail between Stornoway and Edinburgh was about equal and had risen from £50 in 1791 to £90 in 1797.

Both Town and Landward parts grew as shown by the rising census returns.

Census	1801	1811	1821	1831	1841	1851	1861	1871	1881	1891	1901	1911
Parish Stornoway	2794	3500	4119	5422	6218	8057	8668	9510	10389	11779	12983	13438
Burgh						1354	2391	2608	2535	2693	3386	3852	3806
Landward						4864	5666	6060	6957	7696	8413	9131	9632

Census	1921	1931	1961	1961
Parish Stornoway	13366	12116	12791	
Burgh	4079	3770	4954	
Landward	9287	8346	7837	

After 1811 a decline set in but Stornoway Parish did not suffer as did the more remote ones; indeed what was lost by emigration to the cities or the colonies was, to a large extent, made up by the movement of people towards the centres of new occupation after the fishing industry began failing.

For the Parish, as I ascertained from the death certificates, there was but one doctor from 1855 till 1858. In 1880 another medical man's name appeared and a third in 1883. Until 1876 there were no practitioners outside of Stornoway.

In 1872, 155 deaths took place in the Parish; 12 were due to smallpox and all the victims were unvaccinated and 48 uncertified - 11 due to scarlet fever - 6 to diphtheria. Of the 155 who died, 24 were under 1 year and 14 between the ages of 1 and 4. In 1874, 234 deaths were recorded, 58 uncertified, 38 under 1 year and 32 between the ages of 1 and 4 years. Croup accounted for 48, measles for 5, bronchitis for 7 and there were 11 maternal deaths.

The next year, 1875, deaths totalled 311, 65 of them uncertified, 30 under 1 year and 76 between 1 and 4 years. It was a year of dreadful epidemics; whooping cough killed 57, diphtheria 32, scarlet fever 33 and there were 7 puerperal fever deaths.

STATISTICAL ACCOUNT - BARVAS PARISH - 1797

In the Statistical Account the Parish of Barvas is also noted as an area where the Five Night Sickness is prevalent and the writer, the Rev. Donald Macdonald, noted that no recoveries were observed; further, "its nature is not comprehended by the most skilled in the Island." He also stated that the extraction of oil from the liver of the fish caught is an important trade; there is but one school with only 20 pupils and he describes the houses as damp and dirty.

The population was estimated by Dr. Webster in 1755 at 1,995. The Rev. Macdonald said no register was kept but there were 439 families with 2,006 souls, 914 male and 1,092 female.

John McCulloch, M.D., gives very interesting information on the Ness men in his book, "A Description of the Western Isles of Scotland - 1891."[4] "Numerous fishing boats are generally to be seen about the Butt, manned each by 9 men rowing 8 oars, in double banks, a practice nowhere else to be observed. The

people themselves are also strikingly dissimilar to the general population of the Islands, preserving their unmixed Danish blood in as great a purity at least as the inhabitants of Shetland, and probably with much of the manners and appearance of the times when the country was an integral part of the Norwegian Kingdom; they are all fat and ruddy. They possess almost universally the blue eyes and sanguine complexion of their original ancestors and, with their long matted hair never profaned by comb or scissors, cannot be distinguished from the present race as we still meet them manning the Northern ships." Almost all the local place names are of Norwegian origin. There was no local doctor till 1875; Stornoway's medical man was relied upon.

Barvas Parish population - census returns.

Census	1801	1811	1821	1831	1841	1851	1861	1871	1881	1891	1901	1911	1921	1931	195
Barvas	2233	2165	2568	3011	3850	4189	4609	4950	5325	5699	6736	6953	6660	5876	511

The emigration is taking place mostly from the North or Ness end. At Shawbost there is a very modern tweed mill and, by giving employment locally, it induces the people to stay in this part of the Parish.

At present this Parish is carrying out extensive land reclamation with reseeding and restocking the moors with beef cattle.

STATISTICAL ACCOUNT 1797 - LOCHS

The Parish of Lochs information is given by Rev. Alex. Simson. He describes the fishing industry and flax spinning. "There are two schools, one is in existence 3 years and the other just built. Agriculture is very poor; there are no ploughs in the Parish. Epidemics of infectious diseases carry off many. Rose or erysipelas is not infrequent, rheumatism also is common. Stock raising is indulged in. The diet is mostly of fish."

The population, as given by Webster for 1755 was 1,267; in the Statistical Account it is 1,797.

Lochs Parish census figures:

Census	1801	1811	1821	1831	1841	1851	1861	1871	1881	1891	1901	1911	1921	1931	1951
Lochs	1875	1927	2669	3067	3653	4256	4901	5880	6284	6432	4733	4750	4396	3849	3111

There was growth till 1911 but ever since then migration had been marked, and it is the South Lochs or Park district which has lost most. Only the weaving of tweed in the homes with what little fishing there is, augmented by land reclamation and restocking, keeps the people there.

While searching the Parish death register I noted many cases of tetanus neonatorum, the last of which was in 1920.

There was no doctor in this Parish until 1875. Until that year the people were dependent upon Stornoway where, for many years, but one medical man practiced. Consequently, there were years when no deaths were certified: 1867 - 58 deaths, (145 births); 1868 - 45 deaths, (140 births); 1869 - 47 deaths, (147 births); 1870 - 50 deaths, (125 births); 1871 - 46 deaths, (151 births); thus there were 246 deaths with no doctor in attendance. With 696 births and no doctor or nurse it is of interest that there were no child birth deaths despite the dreadful living conditions. In 1876, there was a resident doctor and the majority of the deaths were certified. These totalled 95, of whom 26 were under 1 year and 27 between 1 and 4 years. Scarlet fever caused 10 deaths, croup 17 and whooping cough 3. In 1877, 27 died before the age of 1 year and 3 between 1 and 4, croup accounting for 8 and measles for 4. In 1877, croup was again prevalent and killed 15 and, of 77 deaths, 21 had not reached 1 year, 15 died in their first year and 14 between 1 and 4 although there was no great epidemic. In this year there were 153 births and 93 deaths. In 1911, with the population at its peak, births numbered 134 and deaths 68; 8 deaths occurred at ages under 1 and 3 between 1 and 4 years. In 1921, there were 103 births and 47 deaths of which 2 were infants under 1 year and 1 between 1 and 4 years. In 1931 we still have infants dying in considerable numbers, 5 were under 1 and 3 between 1 and 4; the total deaths being 55 and births 59. Incontrast the 1959 figures show 26 births and 23 deaths; all those dying were aged between 70 and 90 years.

STATISTICAL ACCOUNT - UIG PARISH - 1797

The Parish of Uig is in the remote and mountainous yet arable part of Lewis; arable because of the blown shell sand which has neutralised the acid peat thus producing an extensive machair easily worked, warm and producing earlier and finer crops. It was from here that earlier the natives were evacuated to poorer land so that large farms could be made.

The Rev. Hugh Munro gives the account of affairs in the Parish. Among prevalent diseases he mentions rheumatism, erysipelas and epilepsy of infants from about the 5th to 8th day after birth. He was told by the Surgeon of the County that no cases recovered except two which he had attended and one had badly distorted arms and legs as the result of the violence of the fits. The fishing in Loch Roag was good and as many as 90 boats came from all parts of the kingdom. In addition to fishing themselves these fishers bought fish from local people at high prices. Sweden was the market. Shellfish in all their different varieties were very plentiful and still are, and the beaches above high tide in front of some of the hamlets are covered with the empty shells. Seafowl were numerous especially on the Flannan Isles from where they were brought as well as sheep. The eider duck was common and its feathers and down were collected.

The population given by Dr. Webster in 1755 was 1,313. The Rev. Munro found in 1792 that the Parish had 387 families comprising 898 males and 1,000 females. Longevity was a feature, barrenness almost unknown and there were no suicides. The women were strong and powerful rowers and, although they did not fish in the ocean they did in the fresh-water lochs. The Rev. Munro had been there 16 years and had tried to introduce potatoes but at first the people would not grow them. He persisted in their production and now the natives grow and enjoy them. He considered that manufacture must be introduced to maintain the growing population. There were two schools in the Parish.

Here are the population changes over the years.

Census	1801	1811	1821	1831	1841	1851	1861	1871	1881	1891	1901	1911	1921	1931	1951
Uig	2086	2500	2875	3041	3316	3209	2878	3143	3489	3660	4497	4462	3956	3364	2718

This Parish has lost more of its inhabitants than any other in the Island and it has been the more distant West Uig section which has suffered most.

The Registry Office for East Uig became effective from 1859 and my search of the Registers in this area showed the absence of medical certification of deaths each year until 1871 when one was certified by a Stornoway doctor. By 1875 a doctor lived in the neighbourhood. Still few deaths were certified; the vast majority of entries have the cause of death entered thus, "cause unknown." In 1876, of 37 deaths, 14 were "cause unknown," and, except for two

females aged 45 and 17 years, all were infants. Many entries are "Trismus" or "Five Night Fever" but there is no doubt that many more babies were thus lost because, in the "cause unknown" group, the age is after 5 to 10 days. Tetanus was a dreadful scourge in this area.

In 1914 there were 57 births and 52 deaths. Some of the entries are: 11 unknown, 10 measles, all certified, and 14 pulmonary tuberculosis, all certified. "Cause unknown" was the most frequent entry. "Lock-jaw" appears often in the early years, gradually diminishing and sometimes missing one or two years until it disappears after 1926.

In the first years after registration, births greatly exceeded deaths, e.g. 1855-76 births, 42 deaths; 1856 - 87 births, 47 deaths; 1857 - 90 births, 34 deaths; 1858 - 99 births, 43 deaths. The corresponding figures for recent years reveal the change

1950 -	births 26,	deaths 18;		1951 -	births 13,	deaths 22;	
1952 -	" 14,	" 19;		1953 -	" 15,	" 22;	
1954 -	" 14,	" 11;		1955 -	" 14,	" 20.	

From these population figures we see that Lewis became congested, not from lack of space but by subdivision of crofts. This was brought about by the eldest son, the sole heir to the croft, perhaps giving his brother a part of the croft. This latter was, therefore, termed a "cottar" and had not the rights of his elder brother. Further overcrowding took place when someone who did not even share a croft built a house on the common grazing and he was called a 'squatter'; he had no title to any land and no right to graze stock. As all these men married, feeding their families off the land became a problem but, if work was available at the fishing, (now tweed making), food could be procured with the wages earned. At times, a combination of failure in the harvests of sea and land caused distress among the crofters.

Society in Lewis has never been stratified. Fraser Darling, (1955)[5], remarks, "Lewis is almost unique in the modern western world in its being a society still inseparable from its peasant agriculture." The Lewisman has clung much more tenaciously to his home than other Highlanders and Islanders.

Mention has already been made of the McNeil Commission of 1851 which investigated the conditions in Lewis and had strongly recommended emigration to avert catastrophe. The Lewisman escaped this doom because of bountiful fishing catches.

In the Poor Law Magazine for 1883, in an article "Destitution in the Western Highlands and Islands," Mr. Bain,[6] the Fishing Officer, reported a fishing failure: 4,000 Lewismen came back with an average of £3 instead of the usual £6 from the East Coast and the Lewis crofters' chief support was derived from the sea.

Mr. Campbell, General Superintendent of Poor to the Board of Supervision, stated that considerable distress had arisen as the result of the failure of the potato crop. These figures of imports give strong evidence of the extent of the harvest failure:

	Bolls Meal	Bags Potatoes	Sacks Grain
1st September, 1881 to 28th February, 1882	5,998	92	60
1st September, 1882 to 28th February, 1883	22,096	1,331	300

In 1888 another Commission met[7] and issued a "Report on the Condition of the Cotter Population in the Lews." Adverse conditions in fishing and poor prices for cattle were causing hardship. Indeed £40,000 was lost to the fishermen in earnings in 1886 and again in 1887. The practitioner for the Parish of Lochs said, "I observe evidence of malnutrition among the children and old people." A shipmaster, giving evidence, stated that it was not long since women had joined the crews going to the East Coast fishing. These are significant statements when we are considering tuberculosis coming to Lewis.

Dr. Roper,[8] R.N., on H.M.S. Jackal made a medical report to the Commission on the conditions in the various townships in the Parish of Lochs. "The men are well built, powerful and healthy looking. They were exceedingly intelligent and civil ..... They appear to be extremely lazy, long lived, several over 80 and some over 90. The women and girls over 17 are extremely strong and healthy and appear to do most of the work ..... like the men, they are very intelligent. The children up to the age of 8 or 10 show great signs of poverty and insufficient food and clothing; they are thin and poorly clad but, from what I have seen at the different schools, quick at understanding. Those from 12 upwards ..... do not show the signs of malnutrition ..... they read and write exceptionally well; altogether the poorest classes in some of our large towns present a worse appearance than they do here."

"The dwellings are very rudely constructed and extremely dirty ... The cows, sheep and hens all enter at the same door and, before reaching the

habitable portion of the house, you have towalk across some four or five yards of wet and muddy manure which is part of the cowhouse, etc., which is not separated from the rest of the dwelling by any partition."

"The staple article of diet seems to be potatoes with, occasionally, fish, meal and milk, which is scarce in winter ..... everyone seems to be totally without money. Shellfish is very abundant ..... seldom, if ever, eaten.

"The most prevalent diseases ..... anaemia, dyspepsia, ophthalmia tarsi, and enteric fever ..... constant outbreaks ..... due to insanitary conditions of the wells."

The following table from reports by the M.O.H. for Ross-shire is most enlightening showing, as it does the high birth rate and lower death rate.in Lewis compared with the Mainland portion of the County.

	Birth Rate		Death Rate	
Year	Lewis	Mainland	Lewis	Mainland
1891	31.93	21.84	17.57	16.60
1892	28.91	19.54	16.42	17.11
1893	28.39	19.23	15.95	16.78
1894	29.87	20.50	17.17	17.08
1895	26.45	22.02	14.37	18.59
1896	27.98	22.03	10.25	15.52
1897	26.57	20.73	17.93	18.74
1898	25.13	20.18	13.96	14.47
1899	29.57	19.84	13.42	17.76
1900	28.26	18.91	16.20	19.66

Lewis Vital Statistics

Year	Total Births	Total Deaths	Excess of Births over Deaths
1891	881	485	396
1892	830	507	323
1893	823	440	383
1894	728	436	292
1895	816	446	370
1896	873	310	563
1897	811	522	259
1898	675	375	300
1899	793	360	433
1900	764	438	326
	7,994	4,349	3,645

The population at 1891 census was 27,590 and at 1901, 28,949, an increase of 1,359. This is much less than the natural increase and, therefore, many must have left the Island.

From the living conditions described it is rather a surprise to be presented with these figures.

The social and domestic life of the Lewis people is calm and uneventful today as in the past. Weddings are times of great festivities as are New Year celebrations. Before the advent of radio the "ceilidh" was the usual way of spending pleasant evenings. This was a sort of "at home" to which everyone, native or stranger, was welcomed, and in which debates and discussions, singing and reading of poetry with story telling of past events and deeds, took place. The ceilidh was held in any house but, needless to say, the most favoured were those where the parents were intelligent and affable, the more so if they had eligible young daughters.

When the Sacramental Services were held in any locality people flocked from all over the Island and indeed some people followed the services throughout the complete circuit. Houses would be crowded beyond capacity. I have witnessed a crowd of about 40 in a room 12 ft. by 10 ft. with a ceiling height of 8½ ft. and the service would last for 1½ to 2 hours. If anyone was suffering from a respiratory infection, spread was inevitable. Because of this, suggestions were made to hold all Communion Services throughout the Island at the same time. This was never adopted.

Rev. William MacRae, Barvas, writes in the New Statistical Account, (1836), "Their food consists of oat and barley meal, potatoes and milk variously prepared. Their domestic economy is frugal and moderate beyond conception. The produce of a foreign soil, as tea, coffee and sugar, and the common conveniences of art as knives or forks, etc., are to them altogether alien."

In 1841, Seaforth's factor was examined before a Select Committee of the Houses of Parliament. Mr. O'Brian, (a member) - "Do you conceive that a person living in a house, without a chimney and with scarcely a window, and eating potatoes, with fish occasionally, is not a poor person?" Mr. Knox - "He is not accounted a poor person in Lewis; they do not, among themselves, consider a person in these circumstances to be poor."

Women did most of the agricultural work, we are told in the Old Statistical

Account. It was still that way in 1930 and it was also the women who carried the creels of peat to the roadside for loading on to the lorries to take them hehome. I have seen a woman pulling a harrow across a croft. They are very ststrong.

The standard of morality was high. This is seen when the illegitimate birth rate is studied. The table from the Report of the Crofters Commission, 1903,[9] contrasts the Lewis and Mainland parts of Ross-shire.

Table showing percentage of illegitimacy to total births in Ross-shire in 1880, 1885, 1890, 1895 and 1899.

Year	Lewis	Mainland
1880	2.1	6.3
1885	2.2	6.6
1890	1.9	6.4
1895	3.2	6.3
1899	1.9	7.0

For 1899 the figures for the seven crofting counties were as follows, Argyll, 7.5; Inverness, 8.4; Ross and Cromarty, 4.6; Sutherland, 4.2; Caithness, 11.1; Orkney, 6.3 and Shetland, 3.0. In contrast the percentage figure for Moray in the sme year was 12.7; Banff, 13.5 and Wigtown, 14.6, (note: for 1899, Lewis, with 1.9 to Mainland 7 brings Ross-shire to 4.6.)

EXTRACT FROM THE COMMISSION SUMMARY

"Our enquiry as to the Lewis of the past proves that the inhabitants of that Island are worthy of all the attention they had received ..... they are men of strong physical development, of tough moral fibre and of undoubted intellectual capacity. An Island which could produce the ancestors of Lord MacAulay, as also Sir Alexander Mackenzie, the Arctic explorer, (Mackenzie River), and Colonel Mackenzie, Surveyor General of India, cannot fail to compel attentive regard. The physical and moral strength of the Lewisman is partly due to his surroundings. These compel simplicity of life, and foster powers of endurance. They nerve him to face privations before which men, brought up under more favourable circumstances, would succumb."

The Commission found great improvement between 1884 and 1902 - "It is indeed only those who have known the Island in the past and have re-visited

it within the last few years, who can realise and fully appreciated the nature and extent of the progress made."

EARLY LITERATURE ON TUBERCULOSIS IN LEWIS

Martin Martin, who had travelled extensively in the Hebrides late in the 17th Century, left very valuable and interesting information about the people, their habits and customs, and described their illnesses in "A Description of the Western Isles" - (1695, Glasgow University Reprint, 1884.)[10]

"With regard to Lewismen", he said, "the inhabitants of this Island are well proportioned, free from any bodily imperfection and of good structure ... They are healthy and strong bodied people ..... this place hath not been troubled with epidemical diseases, except smallpox which comes but seldom."

"They are still very hospitable, but the late years of scarcity brought them very low and many of the poor people have died by famine."

He remarked on the great infrequency of any signs of tubercular disease, such as scrofula.

It was not until the middle of the last century that much note was taken of health matters in Lewis, and it was a layman who, struck by the virtual absence of phthisis in the Hebrides and North West Scotland first raised the matter.

In 1860, a Mr. Morgan[11], tutor to the Laird of the Island of Raasay, off Skye, noted after seven years there that tuberculosis seemed absent from Raasay. His surprise and interest were so aroused that he wrote to every principal doctor in the area from Cape Wrath to Mull enquiring for their observations on the disease. He received an almost identical reply from all, which was to the effect that the condition was one of great rarity and that, when it did occur, it was in a person who had been south at work in the cities and had returned home suffering from the illness.

From Dr. Miller, the only doctor in the whole of Lewis at that time, he had this answer, "Dr. MacIver, my predecessor, when filling in life insurance forms in answer to the question of tuberculosis in the family, wrote, 'no such disease known here'." Dr. Miller proceeded, "I have practised thirty years in this Island, which contains a population of 20,000 and have often been struck by the immunity of the natives from consumption, but cannot go

the length of saying there is no such disease."

Dr. G. Clark, from Harris, (4,250 people) wrote, "I was practising 32 years in Harris and, during the whole of that time, I cannot recollect more than about half a dozen of my patients who died of, or had tubercular phthisis. In two cases, one contracted the disease while residing at Greenock, the other after considerable residence there."

Morgan, before bringing forward his own explanation for the rarity of tuberculosis in Lewis, reviews the contemporary ideas as to the factors responsible. These were, 1. Climate; 2. Outdoor occupation; 3. Clothing and diet; 4. The presence of ozone in the atmosphere in high proportion. (He quotes Lieutenant Chimmo, a meteorologist with Admiral Fitzroy, as saying that he had to raise his scale reading 0^{o}- 10^{o} to 18^{o} in order to include the deep colours he obtained on his test papers.); 5. A distinction of race as perhaps playing a part in the resistance of the Islanders, (Lewis). He mentions that in the Ness district of Lewis the people are taller, have fair hair, blue eyes and rounded faces, while, in the Parish of Lochs where isolation is greater reside shorter men with dark hair, high cheek bones and thin lips; 6. The "black house" with its peat smoke in high concentration; this last was the factor to which he accorded full marks because it was absent, while the other five might be present in those places on the Mainland where the illness was rampant.

From his correspondence with the medical practitioners Morgan learned that immunity existed only so long as the islanders remained at home. On migrating to live and work in the cities many contracted the disease and often returned to Lewis to die.

Thomas Willis, (1625-75)[12] wrote, "It is a common observation that phthisis more rarely occurs in those regions, whether in England or in Belgium where fires are fed by peat ..... nay more, that those places are beneficial to health for persons liable to phthisis or for those suffering from it, and that it is in many cases most sanitary."

It was the constant sleeping in the smoke, since the fire burned all night, that had the beneficient effect of keeping the inmates free from colds and coughs, said Morgan, but added that, despite these advantages, it did not prevent scrofula.

He describes how, when in attendance with an emigration officer inspecting prospective emigrants, "a large proportion were rejected from exhibiting unmistakable signs of a scrofulous diathesis. In none of these rejected families has a case of pulmonary consumption occurred since that period ..... If then this scrofulous cachexy which is, in general, so favourable a soil for the development of pulmonary tuberculosis, is rife and, if tubercle, notwithstanding, is singularly backward in invading the lungs, may there not exist, as far as these organs are concerned, some specially protective influence?" This was an acute observation though the explanation did not lie in the presence of peat reek.

From the practitioners in the Hebrides and in the North West he had statements to the effect that there was less consumption in those black houses of the original type, that is those without a chimney, so that the peat reek lingered longer in greater concentration.

Henry MacCormac, (1868)[13], makes reference to the Hebrides and the effect of peat smoke conferring immunity on the natives. He states, "my averment is that tubercle ..... is alone caused by air already breathed, in such wise that, if air breathed in part be breathed habitually, tubercle is inevitable and secondly, if no part of the air breathed has been breathed before, tubercle is impossible. The crowning instance, however, of perfect exemption from tubercle is furnished by the inhabitants of Argyll and the Western Hebrides; here there is no consumption at all and yet all the alleged influence ordinarily assumed to be productive of the malady are extant. The rest of Scotland is desolated by consumption but not the Hebrides. The fortunate Hebrideans live in fact in houses so constructed as to be permeated by a ceaseless change of air by reason of having a constant hearth fire and a hole in the roof. Thus it happens that the air is never, day or night, winter or summer, for a moment stationary, and thus too it is true that the inhabitants never rebreathe // or possibly can rebreathe their own pulmonary excretions. The effete carbon is burned off. There is no tubercle and no consumption, consequently the instantia crucis, (crucial test), which I set out with, I submit is furnished in its fullest force and integrity."

The Editorial in the B.M.J. for 1st May, 1869, rejects MacCormac's carbon

theory for the origin of tubercle but, at the same time, drew attention to the wonderful freedom from phthisis which the Hebrides enjoyed.

Smith, (1893)[14], agreed that, while the natives remained at home, they rarely suffered but were very prone to contract the disease when they went to work in the cities. It was his opinion that many had inherited the disease from their fathers and "required but the exciting cause to produce the disease." Enquiry in many cases revealed the presence of scrofula, or consumption, or insanity in the home, he wrote. However, he thought the predisposition to breakdown would have been lessened had the migrant remained at home. Another observation of his was to the effect that strumous conditions were very prevalent and that many died in infancy or youth of scrofulous complaints before the age at which pulmonary tuberculosis developes. In a later paper to the same Journal he condemned the "black house" and its peat smoke as well as its general lack of cleanliness.

K.N. MacDonald[15] wrote in the Ed. Med. Jr. in 1873, "On the causes of the predisposition to phthisis among natives of the Hebrides and West Highlands" and opposed Smith's view that a predisposition existed as the result of inter-marriage and refuted the statement that scrofula was a common cause of death in infancy.

A pamphlet by John MacNab[16], 1869, repeats the statement about the great infrequency of the malady in the area. Peat smoke, he found, had valuable antiseptic and protective properties resulting from the presence of creosote and tars, but he doubted the conservative properties claimed for it by Morgan. The climate was not always mild he said, declaring that the Gulf Stream began to take effect on the area only at the beginning of the century (nineteenth presummably) and, prior to that, severe frost with snow for long periods was common in winter. He quotes J.B. Juke who wrote in Medical Notes on New Zealand, (Ed. Med. Jr. 1863) that, even with its mild climate, 50% of the population suffered from scrofula. "To be a Celt" he said, "conferred no benefit unless it be that he suffers less if he remains in his home area." For him, the immunity resulted from the great amount of algae on the beaches which liberated a superabundance of oxygen.

Rev. Dr. M. Maclennan,[17] St. Columba's Church, Edinburgh, (a Lewisman who

left in 1880) wrote in 1920, "The people know the name of the disease, but little or nothing about its nature or that any danger arose from living in close contact with the patient. They shun any and every 'fever' but, in the case of consumption, they had no more apprehension from it than for an old-fashioned cold. I am told that the attitude towards it is very different now."

The Editor of the local paper, "Stornoway Gazette"[18] has a letter written by Sir James Matheson,[18] the proprietor of the Lews at the relevent time, to his prospective coachman to inform him that there was no tuberculosis in the Lews.

The Registrar General has this as an introduction to his first Annual Report, 1855;[19] "I desire, in particular, to direct your attention to the interesting results arrived at relative to the small comparative mortality from Phthisis (or consumption) in the Western Isles and in Argyllshire, the particulars of which you will find detailed in the Superintendent of Statistic's Report to me on the causes of death." (See page 29a overleaf).

A Mr. W. Anderson Smith visited Lewis regularly and wrote various articles about the people, which he collected in "Lewisiana" 1875.[20] "No visitor can help being struck by the fact that in The Lews there is an intelligent people still living in the most primitive of known dwellings, dwellings that carry us back to the earliest dawn of civilisation, and that men in contact with English cultivation, many of whom have learned to speak and write the English tongue, are more degraded than Africans in their habitations."

"We were much struck by the healthy appearance of the children ..... a common statement is that the rising generation cannot compare for physical strength and stamina, as well as <u>immunity from disease</u>, with that now passing away ..... accounted for by the lack of animal food, which was formerly plentiful among them ..... tea and sugar used to excess. Delicate chests and rheumatic pains ..... they account for by the absence of their home made whisky. Still it is an unquestionable fact, vouched for by the medical practitioners long settled in the County, that tubercular consumption is never found among the natives who have always remained in Lewis. Strangers have not the same immunity as they may have carried the seeds of the disease along with them. Natives who have been away for a time, especially girls on service, seldom return not smitten unto death."

He gives the following comparative figures for tuberculosis death rates per 100,000 living.

Insular	Mainland	Towns
237	285	515

Scotland had a total of 10,007 tubercular deaths, or 3.36 per 100,000, which represented 17.5 per cent. of all deaths. The rate for England, he quotes as 364 per 100,000, while for Massachussets it was 479 per 100,000.

A point to note is that Insular here covers all the islands around Scotland, and at this period of time, 1855, Orkney and Shetland had relatively high rates. The Registrar General writes, "It is an old tradition, which is confidently repeated at the present day, that the natives of the Western Islands are remarkably free free from pulmonary consumption ..... One Registrar had 14 deaths entered as 'consumption', 10 were over 60 and one was over 90, so that really only 3 died of true pulmonary consumption, the rest were cut off by old age - vernacularly termed 'consumption'. The 247 deaths entered in the table as deaths from 'phthisis' include all those entered on the Registers as arising from consumption. Even thus augmented, the proportion is only 180 deaths per 100,000 individuals living in the Western Isles, or 192 deaths in the whole Insular Districts ..... It is quite apparent that the Western Isles exhibit a freedom from consumption surpassing that of any locality to which we send our consumptives."

He considered the diet of fish, fish liver and marine products of all kinds, cockles, limpets, mussels, oysters, clams or scallops, alive or boiled in milk, sea birds of all varieties, dulse, tangle and carageen pudding and "slochan", a delicacy made by boiling a dark sea-ware with butter, were most beneficial, health giving and protective. But peat reek he declared was the factor conferring immunity.

Following on the Crofters' Commission Report of 1903, a Lewis Local Committee[21] was set up. The Committee made suggestions, contained in their Report of 1903, for the improvement of housing in Lewis. They recommended the creation of a post of full-time resident M.O.H. with a Sanitary Inspector in each parish. They considered the District Nursing Midwife Service, then consisting of two nurses in Stornoway Parish and one in each of the others too small and recommended a considerable increase in staff. Not until 1911 had Lewis a full-time resident Medical Officer of Health.

The comments of this Committee on tuberculosis are noteworthy: they wished a Sanatorium, but this did not come until 1920 when its erection and maintenance were undertaken by the British Red Cross Society, (Scottish Branch.)

"The well-known causes which predispose to those diseases, (phthisis and other tubercular affections) are nowhere more potentially evident than in the Lews; over-crowding, insanitary dwellings, absence of drainage, faulty dieting and other depressing influences affording unrivalled opportunities for their origination, propagation and spread. The baneful effects of these conditions, as compared with the better state of things which obtain on the mainland part of Ross and Cromarty, can readily be seen from the following table compiled from County M.O.H. Reports."

M.O.H. Ross and Cromarty Reports (from Lewis Local Committee under Scottish Office) - Report 1903[22]

	Estimated Population		Deaths from Phthisis		Death Rates per 1,000	
	Mainland	Lewis	Mainland	Lewis	Mainland	Lewis
1892	48,108	28,097	26	38	0.54	1.135
1898	40,566	26,857	45	47	1.11	1.750
1902	38548	25,298	31	46	0.80	1.818

From the tables given it will readily be seen that the epidemic was waxing strongly, so strongly, indeed that about 20% of all deaths were accounted for by tuberculosis. The tuberculosis death rate was 242 per 100,000, 216 for Scotland, and still nothing was being done to halt its progress:this was in 1905.

The Report of the Medical Relief Committee, (Local Government Board), 1904,[23] enlightens us on the changed diet. The children are now having nothing other than tea and bread for breakfast and the distance from the school to their homes meant that they got no other meal until they returned in the late afternoon. "Going on from year to year in this way the physical stamina of the child is bound to be undermined and they are sent in the world with their powers of resistance to disease, such as consumption, greatly reduced."

HIGHLANDS AND ISLANDS MEDICAL SERVICES COMMISSION REPORT[24]

Consequential to all the adverse reports of the various Commissions of investigation into the economic and social conditions exposing, as they did, the dreadful state of housing and sanitation and the inadequate provision for medical attention to the crofter class, the Highland and Islands Medical Service Commission was set up and it reported in 1912.[24]

This Report gives the unvarnished truth about conditions then existing. This led to the setting up of the Highland and Islands Medical Service which became world renowned. A General Hospital was established in Lewis with a Surgeon Superintendent; a scale of fees within the means of the people was fixed and the medical men got mileage grants to enable them to attend to distant patients.

Tuberculosis bulked large in the Commissioners' minds and much evidence on the question was obtained from practitioners. The findings are worth quoting extensively.

Section 4 - Insanitary Dwellings: "In recent years the Island of Lewis has in this respect attained an unenviable notoriety ..... and though there is evidence of improvement here and there, yet, judging by accounts given us on the spot and by our own observations, the old order at the present rate of progress must prevail far into the future.

"By way of further recent proof we would refer your Lordships to the last Report on Lewis by Dr. Murray, the District Medical Officer of Health, (Annual

Report on the Public Health of County of Ross and Cromarty, 1911.)

"The frequency of chest complaints, in measles and whooping cough, and the heavy child mortality therefrom, the recent outbreaks of enteric fever and typhus fever he attributes mainly or wholly to the grossly defective housing of the people.

"Concerning consumption, he refers to 'houses of practically only one room with damp walls, damp clay floors, sunless interiors and a vitiated and smokey atmosphere and the cattle under the same roof with the human inmates, the surroundings usually badly drained and the site often damp. When a case of phthisis occurs in one of these houses isolation is impossible. In too many cases the patient spits on the floor and on the floor of the Church and meeting places scattering tubercle bacilli all round. When one considers the probability of the cattle being affected with tuberculosis under the conditions prevailing what else could we expect than a wide prevalence of the disease? Yet in the Parish in which these evils are most rampant, there is but one doctor to a population of 7,000 spread over an exposed seaboard 27 miles in length. That such a condition of affairs as we found in Lewis should exist within 24 hours off Westminster is scarcely credible. Nor is it creditable from a national standpoint.

"In this connection it is worth recording that between the Royal Army, the Royal Naval Reserve, the Army Special Reserve and the Territorial Forces over 4,000 Lewismen are being trained in arms. Every able bodied man in Lewis is a trained man."

For the purpose of a thesis dealing with tuberculosis the question put to the doctors on the subject and their answers thereto are important. Each medical practitioner was asked about the incidence of the malady in his area and also to say whether it was on the increase and, if so, the reason. All agreed that it was more prevalent than it had been some years before, and they were likewise unanimous in considering housing as the principal factor involved.

The population of the Island in the 1911 census was 29,603 and there was much overcrowding under dreadful housing conditions. A Commissioner asked the Barvas Parish doctor whether houses were still being built with cattle under the same roof as humans and, when told that it was so, he

expressed great surprise since he had before him the Housing Bye-laws of 1901 prohibiting such building.

The doctor in North Harris told how the crew of the fishing boats would have one pipe between them all and it was handed round. To this habit he attributed the great prevalence of tuberculosis of the larynx and he instanced three members of a boat's crew from different families who died in the same year. (A staff member informs me that this custom was very common in the late twenties in his native village in Lochs Parish.) The size of the sleeping quarters on these small fishing boats meant that the crews were very much huddled together. He cited as another source of infection the habit of spitting on the hands by a group of women as they sat "waulking" the tweed, i.e. pulling and tugging at it to help it shrink, because there were often sufferers in the team. Furthermore, they took their tea from a common tin. "Apart from confinements, half my visits were to consumptives and 50% of my death certificates are for consumption," the doctor declared.

All the medical men agreed that the people could not pay the doctor's charges; it was the distance charge which was heavy. The distances were great and the visits were carried out by pony and trap, on a motor or pedal cycle, by boat and on foot over rough moorland paths.

There were five doctors for 30,000 people and a nurse midwife in each parish, but there was only one small hospital. Patients suffering from phthisis did not accept the diagnosis, saying it was only a cold with a cough and made every effort to conceal the truth.

Dr. Murray, M.O.H., when talking of the epidemics of measles and whooping cough in which many children died of meningitis as a complication, said, "Many of those cases of meningitis were probably due to tuberculosis." see page 33

Colonel Stewart Mackenzie gave evidence and mentioned that the Seaforth Sanatorium gifted by his wife to Ross-shire in the hope that the cases diagnosed at an early stage of the illness might have institutional treatment to help recovery was in practice getting only very advanced cases. Dr. McLean, the Superintendent of the Seaforth Sanatorium explained that people either did not consult their doctor or, having consulted him, refused to enter the Sanatorium.

Dr. Murray in his 1911 Report said "many of these deaths I consider to be tubercular in nature" - he was commenting on the frequency with which meningitis appeared as a complication in deaths from measles, whooping cough and broncho-pneumonia. From the death registers for the Parish of Stornoway for the years 1900-1910 I abstracted the figures in this table relative to children 0-4 years.

Total number of deaths		Deaths complicated by meningitis
from Measles	37	7
" Whooping Cough	38	8
" Bronchitis and Broncho Pneumonia	33	8
" Meningitis	29	0
" T.B. Meningitis	25	-

Commissioner Dr. Mackenzie, seeking information about the origin of some of the cases of phthisis, closely questioned the doctors about domestic servants who had been south and had returned suffering from the disease and also about the possibility that not a few might have had the trouble in a dormant state before going to work in the cities. "You are aware of the medical view that is steadily gaining ground that they developed the disease in the South but that it may have been for a long time latent" was put to some of the witnesses.

The average annual death rate from tuberculosis over the years 1904-12 was given by Dr. Murray as 219 per 100,000 for all forms of the disease, and 180 per 100,000 for pulmonary forms. The Notification Act had become operative on 1st August and by 23rd August, 32 cases had been notified. (This session of the Commission was held in Stornoway on 11th October, 1912.) Dr. Murray's predecessor used to tell him that when he was a boy there was practically no tuberculosis in Lewis. "It was originally imported and when it came it found the conditions favourable to its spread." Another answer was that many returned from the cities suffering, but he could not enlighten his questioner whether these people had the malady before going South. To Commissioner Dr. Mackenzie's question on whether the girls who went on service were poorly housed in the cities, he replied that they were considerably better off as regards housing when south because the accommodation in Lewis was appalling. Dr. Mackenzie: "Is it the case that a large number of the houses house cows and sometimes sheep along with the people?" "Yes, I am afraid it is." "Of course you have rather more than half of the whole of the tuberculosis deaths in the County although your population is not half of the County population. You have a large quantity of non-pulmonary as well as pulmonary tuberculosis?" "Yes." "And the modern view is that certainly a large part of the non-pulmonary tuberculosis is due to infected milk?" "Yes, it has been my opinion all along that milk was a great causative factor in Lewis." "Sothat, under the conditions in Lewis, we may reasonably suppose not only that the cows are infecting the people, but that the people are infecting the cows?" "Yes."

Commissioner Dr. Mackenzie hoped that the Commission would recommend a tuberculosis hospital and sanatorium. In this plea he was supported by Provost Mackenzie who was also Chairman of Stornoway Parish Council. In his evidence

Provost Mackenzie said: "Phthisis has now been made a notifiable disease and, owing to the ravages made by this disease in Lewis, a sanatorium is necessary. The great difficulty to be overcome, however, is the provision of sanitary dwellings in the rural areas and getting the people to call in a doctor at the early stage of the disease. The delay on their part tends to spread infection particularly in the black houses before treatment of the patient commences."

Dr. Victor A. Ross in the Parish of Uig had 4,462 persons to look after and had sometimes to travel 30 miles. He had either to go by motor cycle or hire a car at 1s. 9d. per mile. On the Island of Bernera he had 750 people under his care and there was no wheeled traffic there at all; he reached the Island by a public motor launch which sailed daily. He testified to the increasing amount of suffering and the rising death rate from tuberculosis. He knew that many of the sick domestic servants returning home from the south had been infected before leaving or, as he put it, "There has always been a taint in the family." It was a common thing , he said, to burn down the black house where many members of the family had died of phthisis in an attempt to get rid of the infection. He added that many quite advanced cases made good recoveries in the "sheilings". These were small editions of the black house on selected places on the moor, remote from habitation, and there the patient rested in the open air accompanied by some relative who took a cow and some hens out to the selected places on the moor, for summer grazing. These sheilings correspond to the tuberculosis hut shelters supplied by the Local Authority many years later. He had few non-respiratory cases. According to him, the people had a good diet of fish and mutton but little in the way of vegetables. The cattle were of Highland breed and resistant to tuberculosis; they gave little but good milk. The pity, he declared, was that the milk was kept exposed.

A farmer witness thought that 4,400 people were too many for one doctor and even if the doctor had sometimes only two calls in a fortnight to some localities that was because the people could not pay; not that there was no need for more medical men. The fee for someone 25 miles away was 25/-. A Bernera witness said the people were well fed, their diet was milk, eggs,

porridge, butter, fish and mutton, and the doctor's fee for their Island was 10/- or 12/-.

Dr. Cameron in the Parish of Lochs found tuberculosis very prevalent. He considered peat smoke to be irritating to the lungs. Asked about infantile tetanus he said he did have cases but these arose only where the handy woman was in attendance at the birth, and never when he or the trained midwife performed the delivery. He considered it arose from the presence of filth and lack of cleanliness on the part of the untrained woman.

Dr. John Macdonald Ross in Barvas Parish informed the Commission that people were still building black houses and having the cattle under the same roof. Commissioner Dr. Miller asked him about housing conditions: "Do you know of any other part of the civilised world where worse or even as bad conditions exist?" "No." "Is it the case that they allow the manure to accumulate in their houses for nine months of the year?" "Yes." "You cannot conceive of anything more dreadful than exists here. It is a blot on civilisation." "Yes." Dr. Ross confirmed that the milk was left exposed to all sorts of contamination even in the bedrooms. The previous year there had been an epidemic of typhus in Dr. Ross's Parish; 20 cases with 3 deaths.

From the number of uncertified deaths we see how badly off the people in Lewis were for medical attention.

For the Commission, Dr. J. Crawford Dunlop, Statistical Officer at Register House compiled the following table to show the percentage of deaths uncertified in different areas.

	Percentages Uncertified	
	1881	1910
Shetland	69.9	24.2
Sutherland	54.4	26.0
Ross and Cromarty	47.4	22.4
Orkney	-	17.3
Inverness	38.4	15.8
Caithness	-	6.5
Scotland	10.9	2.0

For the Parishes in Lewis he had this table giving the average percentage uncertified for 1908, 1909, 1910.

West Uig	69%
East Uig	61%
Lochs	41%
Barvas	36%
Stornoway	17%

Lewis was very much worse off in respect of the number of medical men in practice than any of the other islands. Skye with 13,317 population had 8 doctors. In Shetland there were 12 doctors and in Orkney, 21.

THE BEGINNING OF THE EPIDEMIC

SOURCES OF THE STATISTICAL MATERIAL

Lewis, as part of the County of Ross and Cromarty has at different times had its vital statistics completely incorporated in those of the County as a whole in the Registrar General's Annual Reports, hence it was impossible to get data relative to the Island. In order to get over this difficulty I searched each Parish Register and extracted the information necessary for the purpose of this thesis. I did this for each year since 1855. The particulars noted concerning tuberculosis, (although I collected much information on other deaths), were sex, age and site of the disease. From the Registrar General's Office I obtained for each census the numbers living in the various age groups. The Statistical Officer in the Home and Health Department kindly had the rates for the age groups worked out for me on the basis of the figures which I supplied

Prior to 1911, there was no correction made for the domicile of those dying away. Since 1911, I do not have these, but whenever it was possible to get the Registrar General's figures, these were used. Since 1950 Lewis has been entered separately in the Annual Report issued by the Registrar General and I was therefore able to check my figures.

Notification of tuberculosis as an infectious disease commenced in 1912 and the Registers of Notification of Tuberculosis in Lewis are held in the Public Health Office here and are available to me. From these the relevant data has been extracted to enable me to compile the tables and draw the graphs. The information on tuberculin sensitivity in the Island and also that about B.C.G. vaccination are from my own surveys.

The full results of my search of the Parish Registers is given in tables, but it is perhaps well to consider the earliest records here in view of the declarations made in the contemporary literature cited before.

We are at once in difficulties. Thus for the year 1855, 37 persons are registered as having died of consumption and there were 127 deaths all told that year in the Island. Thus we have a relatively high proportion dying of

SOVAL LODGE

Here the first certified death due to tuberculosis occurred – the deceased woman came from the mainland.

tuberculosis; 11.3% The Register General gives the corresponding figure for Scotland as 17.5% for 1855. Can this be explained? Four of these deaths were certified; there was but one doctor for an area like Lanarkshire without roads.

The Registrar General, in his first Annual Report[19], drew attention to the great number of old people registered as having died of consumption and he explained that "to Gaelic Registrars 'consumption' as a cause of death meant any wasting disease hence, in the case of old people, the entry 'consumption' need not necessarily mean tuberculosis."

That this was the case will be readily agreed when the graphs of age/sex specific death rates are looked at. We see that the rates for old men and old women between the years 1855 and 1885 are much higher than the rates for the youthful groups and this is surely contrary to recorded experience of what occurs when tuberculosis is first introduced to any country.

For the ten years 1855-64, of 128 male tuberculosis deaths, 37 are over 55 years of age. It must be remembered that the vast majority were never seen, far less certified at death by a doctor.

In connection with the introduction of the disease to the Island the examination of the Registers for Lochs Parish is revealing. From the 1855 entries I extracted six deaths recorded as due to consumption, F29, F13, F28, M1½, M9, M3; the population then was 4,256 and all told there were 63 deaths from all causes. As already written, there was but one doctor in Lewis and he was at Stornoway, 14 miles away, with only a track over the peat moor. Of the 63 dying in the Parish, only one, the female 28 years, was certified by Dr. Roderick Millar.

The point of interest and importance lies in the fact that this female died of consumption at Soval Lodge, a shooting/fishing lodge, whose occupying tenant was rich enough to call in Dr. Millar; she was from Caithness where the disease was very prevalent at that time. From here we are to trace the spread of infection because the tenant of the lodge at the time has left a book, "Twenty Years' Sporting in Lewis" by "Sixty-one"[25], (the Rev. Healey Hutchinson) dealing with the years 1850-1870. In the story he talks of another of his employees, "poor Calum would have been the richest man in the village but for the fact that he lost all his sons and daughters with consumption

and he looks like going that way himself." This sent me back to the registers to search for the family and I found them from the common surname and identical address - three males and two females whose ages ranged from 20 to 34 years and who all died within 9 years.

A look at the death statistics for Lochs Parish is revealing.

PARISH OF LOCHS

Year	Births	Total Deaths	Certified Deaths	Total T.B. Deaths	Certified T.B. Deaths	Ages of T.B's. at Death
1856	167	64	3	5	-	All over 55
1857	191	57	9	7	2	M 33, 22, 25 F 20, 22, 50, 56
1858	167	63 24 under 1	1	2	-	M 64 F 65
1859	140	44 20 under 1	-	4	1	M 33, 45 F 61, 57
1860	121	57 17 under 1	2	6	-	M 22, 33, F 55, 21, 12, 7/12

The deaths in the Parish of Lochs occurred in villages 2 or 3 miles from one another and, although the members of the crofts are not given, we may deduce from the recurrence of the same patronymics in each of the villages that the spread was in families. Furthermore, we notice the drop in the ages of those dying of tuberculosis.

It was not until 1876 that there was a doctor in the Parish and, in that year, all 8 entries of death from tuberculosis are certified "phthisis pulmonalis."

The Parish of Barvas, twelve miles away over the peat moor, was likewise dependent on Stornoway for its doctor until 1875. In 1855, of 74 deaths only 3 were certified and, of the 3, one was a female 20 years old who had spinal tuberculosis. But of 7 entered as "consumption" doubts arise on account of the ages, F60, F1½, M92, M74, M66.

The Parish of Uig, the most remote from Stornoway; West Uig, 40 miles, East Uig, 23 miles, was early attacked and suffered, very severely, repeated waves. Although far from Stornoway it had its own early visits from fishing

boats from far and wide because Loch Roag was rich in lobsters and fish of all kinds. These visits were in addition to those by the Stornoway fleets.

In 1914, this locality suffered its worst attack; East Uig had 27% of all deaths recorded as tuberculosis and West Uig had 23%, all certified. Many houses were burned down in desperate efforts to stem the epidemic wave. Our Nursing Superintendent recounted to me the quick demise from this scourge of the vast majority of her school companions and she saw many burnings of saddened family homes.

In the Stornoway Parish registers I noticed such entries as "Domestic servant home from Glasgow," "Stone mason returned from Glasgow," in connection with deaths from tuberculosis.

Stornoway Town, as the central port with much coming and going with the mainland, reflects the earlier consequential attack as revealed in the number of deaths entered as due to consumption.

The dreadful havoc wrought by the disease is evident from these figures. In 1906, 422 persons died in the Island and of these no fewer than 92 were victims of tuberculosis, (22% of all deaths) while, in the Parish of Stornoway that year, 58 deaths out of a total of 212, (27.3%) were attributed to tuberculosis.

Types of Organism involved

A very important feature of the epidemic in Lewis is that during my stay here only the human type of tubercle bacillus was ever recovered from any lesions although specimens of glandular or joint discharge were submitted for bacteriological examination and typing.

Dr. Harley Williams, (1930)[26], tells how he and Dr. Begbie collected 252 samples of milk from the cows of crofters in Lewis and Harris under strict conditions of cleanliness and, after centrifuging each specimen, samples of cream and deposit were sent to Professor Carl Browning at Glasgow University for examination. No specimen so examined yielded tubercle bacilli.

Throughout the landward parts of Lewis the crofters all had their own cows and there were - and still are - dairy farms supplying the Town. These farms have never been able to meet the needs of Stornoway households. During World War I the Stornoway Town Council imported milk from the Mainland and,

although the Town Council had given up the responsibility for the importation before I came, part of the Town's supply still came from the Mainland. When the Milk Marketing Board came into being this extra supply came from the Board. This body pasteurised the milk but before that the milk was 'raw' or untreated in any way.

In addition, the veterinary surgeon tuberculin tested the cows in the farms and in the crofts. The following is from a Report by John D. Macbeth in 1931[27]: "There were no animals slaughtered under the Tuberculosis Order of 1925. Three of the herds; he refers to 3 of the dairy herds supplying the Town, have been tuberculin tested and all reactors removed with a view to obtain a graded milk licence in respect of tubercule free herds. It should not be too difficult a task to eradicate tuberculosis from all the dairies in the Island and maintain them free from this scourge."

By 1936 all the dairy herds had been cleared, but all the dairies were not granted T.T. licences to sell milk so designated because the premises did not comply with the structural regulations.

Mr. G. Munro, the present veterinary surgeon, reported as follows in 1950.[28] "I have on numerous occasions, at the request of the owners, subjected their cattle to the tuberculin test because some member of the family was reported to be suffering from tuberculosis suspected to be of bovine origin.

"Out of the many cattle tested under these conditions, I found only two which gave doubtful reactions, the remainder being all negative. Of the two doubtful ones I considered that, under the circumstances, I was justified in advising slaughter of the animals. The first of these I slaughtered about ten years ago and failed to find any lesions of tuberculosis on post mortem examination. The second one was dealt with only a few weeks ago. (See part of the thesis dealing with tuberculosis infection.) It was suspected that a child in the family had contracted abdominal tuberculosis and the cow became suspect. It reacted to the tuberculin test and was immediately slaughtered. Again I found no lesions of tuberculosis on post mortem examination. From this animal I took a specimen of milk which I sent to the Royal Northern Infirmary, Inverness, for examination for tubercle bacilli. The sample was negative on microscopic examination and I now await report of further biological examination, (found to be negative).

"To summarise the position in Lewis; with the almost total eradication of tuberculosis from among the dairy herds in Lewis, and the almost non-existent incidence of tuberculosis among the crofters' cattle, we can look forward in the near future to the establishment in Lewis of a cattle population which will be absolutely free from tuberculosis."

Mr. Munro's 1951 report[29] states, "During the year the following crofters' cattle were tested by the Comparative Intradermal Tuberculin Test:

Number of cattle tested	-	4,933
Number of reactors	-	11

These figures include cattle which were tested twice for the purpose of getting into the Attested Herds Scheme,

The number tested once	-	3,179
The number of reactors	-	7

Of the 11 reactors, 10 were slaughtered at the Slaughter House, Stornoway and, of these, 7 showed lesions at the post mortem; all the lesions except in the case of one animal being confined to the lymphatic glands. One animal showed tubercular lesions in the pleura; three showed no evidence at post mortem. The eleventh reactor was sent to the Mainland for slaughter. All the dairy herds, with the exception of those at one farm are now in the Attested Herds Scheme."

The statement was often made that the milk from the dairies was infected because the Surgeon found that many patients admitted as cases of appendicitis had markedly enlarged and inflamed glands in the ileo-caecal region and these he notified as tuberculosis; 39 between 1931 and 1935.

I found many of these tuberculin negative; some before ever having appendicitis, (they had been tested at school), others after operation and not a few among young adults who had been notified some years before. These were, in fact, cases of acute non-specific illio-caecal adenitis.

NOTIFICATION OF TUBERCULOSIS

The Public Health (Pulmonary Tuberculosis) Regulations (Scotland) 1912 Act took effect in Lewis from August, 1st that year and from the Register, I found 50 entries till the end of the year. In 1914, all forms of the disease were made notifiable, though only respiratory cases appear on the local Register but, in 1915, 14 notifications of non-pulmonary conditions were entered. For

1916 there are no entries at all. For 1917 there are 49 entries, one of which was non-respiratory; during 1918 there were 44 names and 2 were bone cases. For 1919 there are 50 notifications, 3 being non-pulmonary. So far, the notified cases had been mostly adults but now, in 1920, the School Medical Officer, who was also Tuberculosis Officer, notified a considerable number of younger persons from 5 years of age upwards. Altogether 47 under the age of 15 years, many of whom had spinal caries with sinuses, were registered. There were 9 cases of lupus, 2 of whom had had treatment in Edinburgh. The total notifications for the year were 140; 92 pulmonary and 38 non-pulmonary.

There was an unprecedented spate of notifications in 1921, 276 in all, 50 of them school children. Similarly, in 1922, the notifications were numerous; 249 with 49 school children. In 1923, there were 133, 23 of whom were under 15. So also in 1924 and 1925 the numbers were high; 151 and 177 notifications respectively.

One of the Medical Officers of Health, who preceeded me and who had been School Medical Officer and Tuberculosis Officer informed me that, following World War I, conditions were bad in Lewis. Notified cases received help by way of milk, eggs, butter and, out of sympathy with ex-service men and, in order that they might get these extra items of nourishment, resort was had to entering them on the Tuberculosis Notification Register. Likewise, the children of the poorer people suffering from chest complaints were notified to await admission to a small preventorium with a bed capacity of 8 to 10. This explains in some measure the exaggerated number of cases on the Tubercular Register.

The Medical Officer of Health's report of 1923[30] stated, "No problem in 1923, as in previous years, has caused so much concern as the prevalence of tuberculosis and the underlying economic distress of especially the latter end of the year. No official, coming in contact with the country people in particular, in whatever capacity, could fail to be involved in recording or in attempting to relieve distress."

"On 1st January, 1923, there were in all 640 cases notified previous to 1923 living in the Island. During 1923, 133 fresh cases were notified making a total of 773 cases requiring treatment in 1923; 622 were pulmonary and 151 non-pulmonary. Of these 133 cases, 25 were revealed only at death."

Although the death rate was high, there was no correlation between the notification rate and death rate as can readily be seen from the graph. From the commencement of notification until 1919 the mortality rate exceeded the notification rate; from 1926 onwards there is an association between the two rates. It will also be observed how both rates fall during the late 30's, and how the notification rate rises from 1941, although the death rate lags and does not begin rising until 1943 after which year it mounts steadily till 1948 when it reached its post war peak of 172 per 100,000. The notification of new cases still kept up but the death rate fell.

TABLE OF THE RATIO OF MORBIDITY AND MORTALITY RATES,
per 100,000 for quinquennia - 1920-24 to 1955-59

	1920 24	1925 29	1930 34	1935 39	1940 44	1945 49	1950 54	1955 59	196 62
(a) Notification rate	652	380	303	261	286	247	252	107	14
(b) Death rate	199	164	136	101	77	115	52	18	1.6
Ratio a/b	3.3	2.3	2.2	2.5	3.7	2.1	5.0	5.9	8.7

It would seem that many of those notified in the early twenties were not really suffering from tuberculosis for the ratio is better for that period although facilities then for treatment were not very good. There is steady improvement in the ratio from the late thirties on, but it was disturbed in World War II. In 1961 and 1962 there were no deaths at all for notifications of 20 and 13 respectively.

Notification was never a popular step for either doctor or patient, because of the stigma associated with tuberculosis. I have told already of my first call on a notified case. Quite often the relatives would make the request, "Please do not stop the car at the door but farther along the street." It was no uncommon thing to have the bed-ridden patient turn his face to the wall and exclaim, "I'll die in my bed rather than go there," in response to a suggestion that he should have sanatorium treatment. An explanation for this attitude can doubtless be found in the figures given in the following paragraphs.

There were many deaths from tuberculosis about which the death certificate was the first intimation the Public Health Department had. Each year from 1930

until 1948 there was an average of 4 such intimations. In 1935, 20 out of a total of 38 tuberculosis deaths occurred within 12 months. In 1941, 4 persons died within one month of notification and 5 who died were never notified at all. In the three years 1946, 1947 and 1948, 95 sufferers died and of these 34 had died within a year of notification and, in the case of 11 of the 95, the death certificate was the first and only intimation.

Writing in the Poor Law Magazine of 1888 on tuberculosis in cattle, Henry D. Littlejohn,[3/] M.D. says, "Bovine tuberculosis is a chronic disorder and it may, as in man, last for years before it proves fatal. It may also as in man, undergo spontaneous cure. No fact is more remarkable than that there is no disease which is apparently so curable as Phthisis. I hardly ever open a body of a person dying from injury or disease but traces of the previous existence of tubercle in the lungs are found and it is apparent that this disease has been arrested and a cure effected."

Despite the absolute truth of this statement it was not so easy to treat successfully those in whom the disease had advanced sufficiently far to lead to a diagnosis with notification of tuberculosis.

TREATMENT

In 1920 the Sanatorium had been opened and run by the Red Cross Society; it was for service men but was extended in 1928 to provide accommodation for women and children. It was well equipped and an x-ray apparatus was installed in 1939. Orthodox treatment was given to those entering the Sanatorium but, because of the lateness of the stage at which the patients agreed to enter the Sanatorium and also because of the rapidity with which the disease progressed in the individual, little could be expected and the death rate was high; 16 per cent. of in-patients died in the 30's, falling steadily to 8.6 per cent. in 1942, only to rise again to 16 per cent. in 1948.

Between 1930 and 1942, the ratio of deaths in the Sanatorium to total tuberculosis deaths in the Island was 1 to 3; between 1943 and 1948, this ratio now became 1 to 2. From the table of Morbidity/mortality rates it is seen that, between 1940 and 1944, 26 per cent. of those notified died and this jumped to 46 per cent. for the years 1945-49. Chemotheropy after 1949

led to a dramatic reduction in mortality. Much infection had been spread around before admission to the Sanatorium and this was another unfortunate feature of the delay.

From 1945 until 1948 the demand for institutional treatment was far in excess of the bed accommodation provided, 26 male and 26 female beds. A waiting list was now essential despite the fact that the Infectious Disease Block (26 beds), had been taken for tuberculosis cases; the Recreation Room had 12 beds installed and the patients' dining hall was utilised as a ward of 8 beds. It was even found necessary to induce and carry on artificial pneumothorax at patient's homes, (on occasions in black houses). The turnover of in-patients was between 130 and 140 a year and as many as 40 persons were attending artificial pneumothorax refill clinics. From 250 to 300 x-rays were taken annually; in 1948, there were 173 first x-rays and 396 re x-rays. In addition there were non-pulmonary cases, mostly spinal lesions, requiring plaster of paris jackets and splints to be followed by celluloid (non-flam) and, latterly, by "Fibrenyle"; a plastic mouldable cold and setting on stove heating on the plaster of paris body mould.

In 1948, the Sanatorium passed out of the hands of the Local Authority, which had nothing more to do with treatment but now concentrated on the preventive side. The preventive side had not been neglected but, because of the War and shortage of staff, there was less time for clerical work. All school leavers were x-rayed from 1942 on and contacts were kept under review also.

The effect of the 1939-45 War on tuberculosis in Lewis is brought out in this table. Between 1940 and 1949, 649 persons were notified as cases of tuberculosis; 215 of these were in respect of service men and women and 71 of these died aged 18 to 51. Over the period the average age at death was 26 years; in 1940 it was 23 years.

Table on page 47.

Excerpts from the County M.O.H. Report for 1948.

"The total non-respiratory deaths during 1948 were Lewis 4 mainland 3, (1947 Lewis 3 mainland 3) the respiratory deaths Lewis 39 mainland 11 (1947 Lewis 29 mainland 20.) If the population of the Lewis is considered to be about 2/3 that of the total population of Ross-shire then the death rate for respiratory tuberculosis for the Island of Lewis is approximately 1.52 per 1000 population as against a figure of .6 for the county as a whole and .29 for the mainland.

A high respiratory tuberculosis death rate is usually associated with poor social conditions but so also is a high infant mortality rate. The infant mortality rate for the Island of Lewis is approximately 15 per 1000 live births, probably about the best in Britain, so the high respiratory tuberculosis death rate must be due to something more specific to the disease itself than social conditions. This "something" may be a lack of what was once upon a time called "constitution" and is now better described as "inherited immunity" a complex state resulting from generations of forebearers being exposed to infectious diseases and in particular in this instance tuberculosis.

It may be, that by the judicious use of B.C.G. vaccination this lack may be made good in part at least, but until this procedure is in operation for several years at least, it will not be possible to measure its effect."

"As regards the County Hospital, Stornoway, Dr. Doig reports as follows:-

There were 131 patients treated at the County Hospital during the year, but with the help of part-time nurses it was possible to admit more patients and one is grateful to the part-time nurses even though they do not completely replace whole-time nurses.

For the year under review there was no long waiting list of patients for admission to Hospital. What is the reason for this? The explanation is to be found in the statement in last year's Report and repeated herein, viz., that those on the waiting-list were offered beds but all refused, the grounds of refusal being that they had waited so long that they felt better and did not need to enter the Institution for treatment.

More patients could be admitted if more nursing staff were available but more beds are urgently required in order that each case, at least the case not too far advanced - might be admitted as soon as diagnosed, when the

patient is willing and indeed anxious for Institutional treatment and there is every hope that such Institutional treatment would effect a cure. A long period of treatment is necessary for pulmonary tuberculosis but if one could admit the patients early in their trouble, it is certain that the time required would be halved. Let us examine what happens. A young person - 17 to 25 - is diagnosed as having an infection of the lung not too far advanced; his parents wish him and he is willing to have Institutional treatment at once; this is impossible; he is advised to rest in bed until a bed becomes available. During his waiting period of, for example, eighteen months, he either dies or improves considerably - fortunately mostly the latter - and when he is offered a bed, he fails to see the need for it since he feels that he has made great improvement. It is true his condition is better but not to the extent which he believes and, should he have a relapse at a later date, his chance of recovering is not nearly so good as it was originally and, more than likely, any attempt at active treatment will have been rendered impossible. I am firmly of opinion that, with the accommodation doubled and constant search for contacts with close supervision of these contacts, tuberculosis in Lewis could be banished in twenty years' time.

During the War when beds were scarce some patients had to have their treatment carried out at home. The young man in the photograph - 17 years in 1946 - had A.P. induced and refills carried out in this black-house. Photo taken in 1954.

Year	Persons Notified	Service Personnel	Service Personnel Deaths	Average age at death of Service Personnel
1940	49	18	9	23
1941	40	11	2	27
1942	77	22	10	26
1943	99	30	16	24
1944	74	30	7	30
1945	88	44	14	29
1946	69	28	7	32
1947	47	11	4	21
1948	66	12	1	25
1949	40	9	1	41
	649	215	71	26

I left the Sanatorium in August, 1949, and became absorbed in B.C.G. vaccination which was now available for contacts.

TUBERCULOSIS INFECTION

The Mantoux test in its different concentrations of old tuberculin was used on occasions for testing contacts in Lewis, but unfortunately no special records could be kept. However, in 1949, I undertook the introduction and subsequent performance of B.C.G. vaccination in the Island. Through letters to the Press and by canvassing the parents of children in the various schools, interest in the matter of preventive vaccination was aroused and, since the disease had played havoc in Lewis, people began to clamour for this protection for their children.

Tuberculin testing was a pre-requisite of vaccination and Allen & Hanbury O.T. Jelly simplified the procedure. In October, 1949, a beginning was made at Aird Junior Secondary School, (200 pupils), and mothers came with all their pre-school children from 6 months upwards. A very high rate of positive reactors was found at this and other schools, even among the very

young. The manufacturers ran out of O.T. jelly and supplied P.P.D. jelly; to my dismay I found the number of positive reactors declining to vanishing point. I raised this matter with the manufacturers and they recalled the unused jelly and again supplied O.T. jelly. I thereupon retested the children at Knock School and, once again, the positive rate was high and in keeping with what had been obtained previously. From this time on only O.T. jelly was used and all the schools in the Island were visited and pupils tested.

The next step was to test again the non-reactors by Mantoux test, (1/100 dilution) and there was a further increase in the number of allergic children. The B.C.G. scheme was intended for contacts only but, because of the widespread allergy associated with the very high mortality and morbidity rates and with numerous positive sputum cases, it was decided to treat all persons as contacts and offer B.C.G. to all giving a negative reaction to 1/100 Mantoux.

TYPES OF ORGANISM INVOLVED - HUMAN ONLY (AVIAN IN POULTRY AND CATTLE)

Before proceeding to vaccinate those suitable, i.e. consenting non-reactors, an attempt was made to ascertain whether the positive reaction could be accounted for by organisms other than the human tubercle bacillus. (D'Arcy Hart, in private correspondence, seemed surprised at the high allergic rate among infants and wondered if all were human contacts.) One well-known authority, (K. Neville Irvine) on hearing that voles are very nemerous in Lewis, advanced the suggestion that the vole bacillus might play a part in the high positivity rate. Contact with children with voles is not a common occurence. I learned from the Department of Agriculture's Poultry Adviser, Miss Munro, that when she had been employed investigating fowl pest and carrying out post-mortem examinations of the dead hens, tubercle bacilli, avian in type, were often present in their livers. Since contact between children and hens is common in Lewis it was considered worth while performing some tests on a group of children.

From the Veterinary Surgeon, Mr. Munro, I obtained supplies of avian tuberculin. After preparing a suitable dilution I performed on a group of positive reactors to O.T. Human, two tests of similar strength; one O.T.

Human (I.T.U.), the other Avian T. (I-T.U.) on the sme arm and then compared the size of the reactions. About 80 children, half in Aird and half in Bayble, were intradermally tested in this way. The avian tuberculin did not always yield a positive result even when the O.T. test was positive, and in only two instances did the induration produced by the Avian tuberculin exceed in diameter that of the corresponding O.T. reaction measurement. The reason for this study was that the bovine tubercle bacillus had never been isolated in Lewis and the cattle were all T.T. tested and tuberculosis free. Thus the avian tubercle bacillus was also ruled out as a supplementary factor in the high infection rate.

A leading authority, (Marc Daniels), who visited Lewis in 1950, thought that it was a waste of time to test with avian tuberculin because, he declared, "no human being has ever suffered from an avian type infection." I was not expecting to find anyone suffering; I wished to rule out avian as a source of some of the positive reactions. I told him that Dragsted (1949)[32], had reported six cases and had detailed the various confirmatory tests which he, (Daniels) declared would require to be fulfilled before he could accept such a diagnosis.

Marks and Birn, (1963)[33] describe 10 cases of infection due to M.avium; 2 cases of cervical adenitis in children and 8 lung infections in adults. This is a condition which they suggest might become more common with the reduction in human type infection.

Steps were taken to have the positive reactors x-rayed and mothers were continually requesting this to be done. About 500 children, aged 2 to 14 years were so examined, but the Regional Hospital Board considered that, in view of the shortage of films at this time and also because of the cost, that they could not continue this most useful service.

According to the reports sent me by the Chest Physician, 32 or 6 per cent. of those who had pictures taken showed radiological evidence of intra-thoracic tuberculous lesions in the form of hilar glands, healed primary foci, segmental pluerisy, old pleural adhesions. Bed rest was ordered for many of these, the period varying according to the Chest Physician's opinion as to the need, and all were kept under review at 3 or 6 monthly intervals until the Chest Physician decided this was no longer necessary.

It is worth while recording that, within 18 months of testing, 16 children who had given a positive reading and who had not been x-rayed for the reasons stated, fell ill and were sent by their family doctor for x-ray. They were found to be affected to such an extent as to be notifiable and 8 were given sanatorium treatment for varying periods of time.

EARLY RESULTS OF TUBERCULIN TESTS AND B.C.G. VACCINATION

The following paragraph and the accompanying tables are from the Annual Report of the County M.O.H. for 1950.[34]

"It is felt that the high respiratory tuberculosis death rate on the Island of Lewis is due to the late arrival of tuberculosis in the Western Highlands, and also because of the low incidence in these parts of bovine tuberculosis which, for many years now, has been an immunising factor on the Eastern Seaboard of the Mainland. With these facts in mind it was decided by Dr. Doig, in consultation with the Medical Officer of Health, to consider all negative reactors in the Island of Lewis as being in a special group, more liable than ordinary, to take tuberculosis and to offer them B.C.G. vaccination. In spite of the enormous amount of work that such a scheme entails, Dr. Doig set to and the following table gives a picture of what has been accomplished by 31st December, 1950. Those figures represent practically the whole school population of the Island of Lewis.

TABLE OF TESTED AND VACCINATED (B.C.G.)

1. Number of contacts tuberculin tested under the B.C.G. Vaccination Scheme

AGE GROUPS

Result	Under 1		1 and under 5		5 and under 10		10 and under 15		15 and under 20		20 and over		Total tests performed	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Positive	-	-	32	23	200	212	284	317	59	60	3	3	578	615
Negative	2	7	180	195	616	654	529	508	68	57	-	1	1395	1423
Total	2	7	212	218	816	866	813	825	127	117	3	4	1973	2038
Percentage Positive	-	-	15	10	24	24	35	38	46	51				

2. B.C.G. Vaccination performed

Group	Tuberculin Tested		Negative Reactors		Successfully Vaccined	
	M	F	M	F	M	F
	(1)	(2)	(3)	(4)	(5)	(6)
(a) Nurses	-	23+24 = 47	-	2	-	2
(b) Medical Students	-	-	-	-	-	-
(c) Contacts	1973	2038	1395	1423	520	610
(d) Others	-	Maids 23	-	Maids 5	-	3

After the schoolchildren, doctors, nurses, school teachers and canteen staff were done, talks were given and testing carried out at the Tweed Mills, Youth Clubs, Y.M.C.A., Offices and Shops. An indication of the enthusiastic co-operation of the young people may be gauged by the fact that dances and whist drives would be interrupted to allow tuberculin testing to be carried out; some came 10 miles to have it done at 10 p.m. and returned three days later for reading and B.C.G. if indicated. This happened in the parish of Uig.

For testing the mill workers and adults, the Mantoux technique was used; three tests, using different coloured syringes reserved for differing concentrations, were carried out; 1st - 0.01 m.g. O.T.; 2nd - 0.1 m.g. O.T.; 3rd - 1 m.g. O.T. At the first round, each volunteer received 1 T.U. in one arm and 10 T.U. in the other. Those failing to react to either of the above received 100 T.U. after the lapse of a week.

A very notable feature of these tests was the severity of the reactions even to 1 T.U. in many of the volunteers. In 1955 a mobile x-ray unit visited the Island and these people were x-rayed. None of them were notified as suffering from acute tuberculosis although several were kept under observation. (Unfortunately the Mass Mobile Unit did not function as well as expected. These were early days and breakdowns were frequent.)

	Total Tested	Positive to 1 T.U.		Positive to 10 T.U.		Positive to 100 T.U.		Negative		B.C.G. Vaccinated
		No.	%	No.	%	No.	%	No.	%	
Male	307	91	29	76	24	109	35	31	10	13
Female	317	79	21	97	30	65	20	76	24	35

From this we have 90 per cent. males positive and 76 per cent. females. There was a higher proportion of females than of males in the younger age groups, (15 - 17 years), who had recently commenced work.

Similarly, when 55 men on H.M. Fishery Cruisers were tested by the Heaf test, all gave pronounced reactions with the exception of the Captain of one ship with his First Officer who were negative and accepted B.C.G.

Late in 1950 I abandoned the jelly test and used 1/100 dilution Mantoux for school entrants where there was no family history, and 1/1000 dilution followed by 1/100 dilution if necessary in older pupils. Adults always had their first test with 1/10000 O.T. and almost everyone over 16, working in the mills, gave very marked reactions with considerable induration.

TUBERCULIN TESTING BY HEAF MULTIPLE PUNCTURE APPARATUS

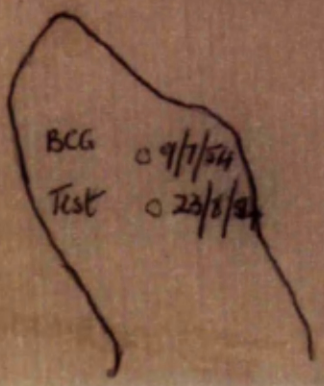
Professor Heaf, Director of B.C.G.,vaccination in Britain, visited Lewis in April, 1952. He introduced me to his Multiple Puncture Apparatus. I obtained one and, after performing thousands of tests on school children whose tuberculin reaction I knew, I was able to evaluate this piece of equipment and, convinced of its many advantages, adapted the Heaf Test as routine.

B.C.G. BY MULTIPLE PUNCTURE - HEAF APPARATUS EXPERIMENTS

In 1953, in the hope of simplifying the administration of B.C.G. and avoiding excessive local reaction, an occurrence which deterred some mothers from having their children protected by B.C.G., I tried concentrated Danish Liquid vaccine administered by multiple puncture; a 1 ml. vial of vaccine was centrifuged and the 0.97 ml. of supernatant liquid was aspirated and rejected. The bacilli in the sediment were transferred to the volar aspect of the left fore-arm and spread with the disc on the Heaf apparatus and then 10-30 insertions, (60-180 punctures by 6 needles) made through the medium, not all in the same spot as the disc was moved slightly before each release of the spring.

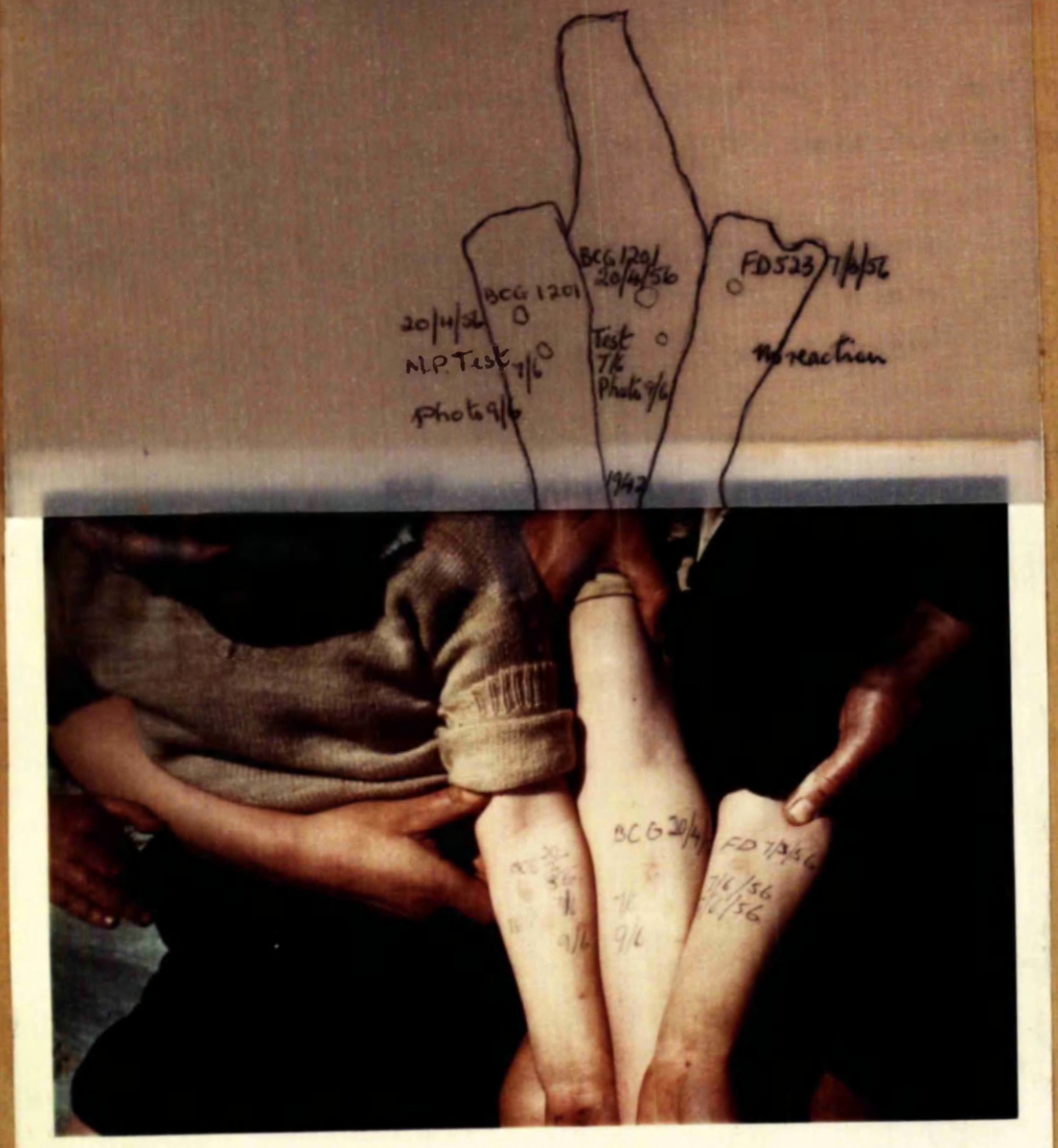
Local reaction appeared soon, after 3 weeks in many cases, as numerous red raised papules, which persisted for varying periods of 3 to 4 months when they disappeared without scar. Allergy also appeared much earlier

To show early attempts to vaccinate by M.P. using concentrated Danish liquid vaccine. Batch 15 strokes – 90 pricks on 9/7/54
Tested (Heaf) 1 stroke – 6 pricks on 23/8/54. Photo by electric light.
Child still positive in 1957



B.C.G. by MP (Heaf) 20 strokes (120 pricks) on 12/3/56
Batch 1195 (manf. 5/3/56)
Tested 28/5/56 Read and photographed 12/6/56.

vacc. note no conversion has taken place. 6 mg/0·75 ml - 20 strokes.



These members of one family - contacts of late father and two aunts. The centre one - a girl of 14 years was P in 1949 and xray then showed hilar adenitis as the under-lying condition. She reverted to N and had B.C.G. along with her brother on her right; the brother on her left had Pasteur F.D. Vaccine (old discarded vaccine) six weeks earlier. It has failed to produce conversion.

than when vaccination was by the intradermal route. This allergy did not last more than several months in a number of cases and it was discovered that this was due to clumping of the bacilli so that some of those vaccinated got many of the organisms while others got few, and so the results were very variable from child to child.

In 1956, Glaxo were producing F.D. vaccine for intradermal use after reconstitution. I secured samples and reconstituted them 10 times strength, and administered the concentrated vaccine by percutaneous injection. The results were better and also more uniform, because Glaxo had, by the addition of dextran, overcome the clumping difficulty.

PERCUTANEOUS B.C.G. VACCINE

In 1956, I asked Messrs. Glaxo if they could produce a vaccine of suitable concentration for multiple puncture. They did so and I have used this vaccine ever since.

When Glaxo F.D. Percutaneous Vaccine was reconstituted as instructed I found that six insertions, 36 punctures, by the Heaf appliance produced results in every way comparable with the intradermal route and without any of the drawbacks. In this connection it is worth noting that no glandular involvement has been observed in 1,000 new-born babies vaccinated by me at the Lewis Hospital. The visiting paediatrician from the Mainland was opposed to B.C.G. for new-born babies because he saw many develop adenitis with abscess formation, following B.C.G. by the intradermal route.

In April, 1952, Professor Heaf visited Lewis to observe for himself how the B.C.G. vaccination campaign was getting on and to assess the needs of the Island population for protection. He concerned himself with the type of the disease indicated by the death returns, notification particulars for sex and the type of case in the Sanatorium. To enable Professor Heaf to formulate a continuing scheme he was given data on which he based the following tables and compiled notes.

NOTES PREPARED FOLLOWING A VISIT TO STORNOWAY BY PROFESSOR F.R.C. HEAF AND Dr. I.M. MACGREGOR 23rd-24th April, 1952

1. Discussions were held with Dr. Stevenson Doig, Assistant Medical Officer

of Health, Ross and Cromarty. Dr. Doig was most helpful and provided the information reproduced in paragraphs 2 to 6 below. We were impressed with the energy and enthusiasm with which Dr. Doig was tackling the preventive aspects of the tuberculosis problem.

2. Mortality: Rates per 100,000. (All forms of tuberculosis.)

Year	County	Lewis	Mainland	Year	County	Lewis	Mainland
1935	64	108	35	1943	47	50	46
36	75	54	24	44	67	71	65
37	84	145	43	45	67	96	49
38	65	79	57	46	69	92	54
39	61	108	29	47	80	121	54
40	44	92	13	48	82	162	29
41	69	87	57	49	63	104	38
42	49	83	27	50	29	58	11
				51		72	

Note: County refers to Ross and Cromarty; Mainland to the Mainland part of Ross and Cromarty.

The persistently higher rate of mortality on the Island of Lewis is noted.

3. Morbidity: The number of new tuberculosis notifications on the Island of Lewis since 1947 has been as follows:-

Year	Respiratory	Non-respiratory	Total	Rate per 100,000 *
1947	35	12	47	188
1948	49	17	66	264
1949	34	6	40	160
1950	75	9	84	336
1951	73	7	80	320

* Based on an Island population of 25,000.

4. Infection Rates: The following tables have been prepared from information received from Dr. Doig arising out of the tuberculin survey which he had carried out during the last few years. They show the results of tuberculin tests performed on children in various parts of Lewis. The figures in brackets are percentages.

	Nicolson Institute		Stornoway (Landward)		Barvas Parish		Lochs Parish		Uig Parish	
Age Years	Posi-tive	Nega-tive	Posi-tive	Nega-tive	Posi-tive	Nega-tive	Posi-tive	Nega-tive	Posi-tive	Nega-tive
0-1	6	0	0	7	0	1	-	-	-	-
1-5	3	49(94)	37	223(86)	1	36(97)	5	48(91)	3	19(86)
5-10	135	277(67)	141	362(72)	69	317(82)	35	167(83)	32	147(82)
10-15	324	227(41)	212	271(69)	90	296(77)	43	139(76)	23	104(82)
15-20	112	100(47)	5	18	1	5	1	1	-	-

Most of the school children in Lewis were tested with the Jelly Test (O.T.). Those who failed to react were retested with the Mantoux Test using 1 mgm. O.T. (100 units). Several months lapsed between these two tests. There were some technical difficulties in the interpretation of the results of the Jelly Test. These difficulties confirm the experience of others when minor changes of technique are introduced. In the outlying parishes the children were tested with a single 100 unit tuberculin test without any unduly severe reactions. This would seem to indicate a generally low state of sensitivity among the school children. Dr. Doig has figures to show that young adults in these areas have a relatively higher degree of allergy.

It was not found possible to x-ray all these children following the tuberculin test. Of those positive reactors who were x-rayed, (about 500), primary lesions were found, 6 per cent., in 27 cases and a degree of pleurisy in another 5. The majority of those attending the Nicolson Institute, Stornoway, is significantly higher than in the rural areas of Lewis. There is evidence, from re-testing which has been performed, that some degree of reversion of tuberculin sensitivity takes place. The relatively low proportion of negative reactors in the Nicolson Institute is notable and leaves the suspicion that a source of infection is present in the school.

The relationship between tuberculin sensitivity and mortality in different parts of Lewis are shown below:-

	Stornoway Burgh	Stornoway Landward	Barvas Parish	Lochs Parish	Uig Parish
Population	4,954	7,837	5,019	3,111	2,716
Tuberculin Ages 5-12 years	50	25	20	20	15
Total T.B. Deaths 1945/50 (5 years)	20	59	26	23	18
Death rate per 1,000*	0.8	1.5	1.0	1.5	1.3

* Quinquennial rate 1945-50

The association of a relatively high rate of infection among school children in Stornoway Burgh with a relatively low incidence of T.B. deaths, and the reverse elsewhere, is of considerable interest.

5. Type of Tuberculosis: It is of considerable interest and importance that the tuberculosis lung lesions encountered in Stornoway are very frequently of the acute exudative type. It would also seem likely that a high proportion of these are the result of a direct progression from a primary infection in young adults.

6. B.C.G. Vaccination: Dr. Doig has offered B.C.G. vaccination to all negative reactors discovered during his tuberculin survey. Altogether nearly 2,000 vaccinations have been performed without complications. One "complication" was demonstrated in a female child. It was thought that this was a case of late auto-inoculation resulting in the production of an ulcer followed, on healing, by the development of a Keloid scar in the posterior axillary wall. Dr. Doig has also offered tuberculin testing and vaccination to all those leaving the Island to take up appointments on the Mainland.

7. The Hospital Service: (i) A visit was paid to the County Hospital, Stornoway, with Dr. Johnston, the Senior Tuberculosis Physician to the Northern Hospital Board, and Dr. Paul the Board's Tuberculosis Physician with this hospital and with the clinical discussions which we had. The recent installation of a new major x-ray diagnostic unit has been a great improvement. The incidence of acute exudative chest lesions and, as would be expected, the dramatic response of these to chemo-therapy is striking.

We fully agreed with the clinical policy to await further reports on iso-nicotinic acid hydrazide before trying it on any but those who failed to respond to other methods of therapy. Professor Heaf demonstrated his multiple puncture technique of tuberculin testing, through undiluted adrenalised old tuberculin. There is practically no waiting time for admission to hospital in Lewis and all patients for thoracic surgery go to Aberdeen, (Woodend Hospital - Mr. Sambrook Gower.)

(ii) The provision of x-ray facilities for case finding had given rise to difficulties. Even if x-ray film were available it would be a most costly business to x-ray all school children, (in connection with the tuberculin testing and B.C.G. vaccination scheme), both in terms of time and material and as regards transport. We do not think that x-ray screening would provide an effective substitute. The small and isolated nature of the population make this type of community a special problem as regards group x-ray examinations. The present Mass Radiography, (Mobile), unit is too large and cumbersome to use the roads, even if it could be transported to the Island. Professor Heaf suggested the possibility of using a new type of x-ray set, (Swedish), known as the Schonander 70 mm. x-ray Unit. With suitable transport this unit is mobile.

1. Possible factors influencing the spread of tuberculosis and the low resistance indicated by the acuteness of the disease in Lewis:

(i) Low inherent resistance as a racial factor.

(ii) In-breeding.

(iii) The presence of unknown infectious individuals in the community and the contact between these and non-reactors to tuberculin in workshops, fishing boats, the home and elsewhere.

(iv) It is possible that the lack of green vegetables in the diet may have some effect in lowering natural resistance.

(v) The tendency for adolescents and young adults to leave the Island and develop the disease in the industrial centres.

(vi) The infection of milk by milk handlers suffering from infectious tuberculosis.

(vii) Lack of ventilation in the homes in winter.

2. Suggestions regarding some possible lines of action:

(i) The active search for unknown infectious cases of pulmonary tuberculosis. Much of this work is, of course, being done at the present time -

(a) The examination of all in-patients and out-patients who present suspicious symptoms.

(b) The examination of domiciliary and other contacts of all active cases.

(c) The institution of a system of group x-ray examinations. The ideal would be the periodic examination of the entire population over 10 years of age. The population is too small to support a full-time mobile camera unit, but it would be a great help if assistance of this kind could be given from time to time.

(ii) In addition to the other methods of prevention which Dr. Doig is carrying out, the extended use of B.C.G. vaccination is of importance. There is little doubt that the population suffers from a lowered native resistance and that there is a tendency for the primary infection to become progressive. In these circumstances, the extended use of B.C.G. vaccine is justifiable. The most important groups to be covered are school leavers and infants under 1 year, especially the former. The latter present special difficulties and drawbacks, but these can be minimised and the advantages outweigh them. Those who leave the Island for the industrial centres comprise another important group which should be tested and, if necessary, protected by vaccination.

That tradition dies hard in the Islands is exemplified by the following amusing "cure." The father of the child with the "complication" did not agree with B.C.G. vaccination and had the abscess treated by the method mentioned in Macbeth -

> "All swoln and ulcerous, pitiful to the eye,
> The mere despair of surgery, he cures
> Hanging a golden stamp about their necks,
> Put on with holy prayers."

unfortunately, the stamp is no longer golden but silver alloy.

THE INFLUENCE OFF B.C.G. VACCINATION ON THE EPIDEMIOLOGY OF TUBERCULOSIS IN THE ISLAND OF LEWIS

Objects of the Investigation

1. To study trends of mortality and morbidity from tuberculosis in Lewis with particular reference to the period between 1945 and 1958.
2. To associate with these trends details of the vaccination programme during the same period.
3. In particular, to study the subsequent incidence of morbidity and mortality from tuberculosis in the school population which was subjected to a tuberculin survey and vaccination of negative reactors in 1949-50.

4. To study the incidence and death from tuberculosis among the school population referred to in para. 3 above in relation to:-

   (a) those initially tuberculin positive identifying those highly and those only moderately sensitive:

   (b) those initially tuberculin negative, unvaccinated, (this group included largely those who refused vaccination.)

   (c) those initially tuberculin negative; vaccinated.

Before 1949 the tuberculosis notification rates on the Island were relatively great, (see graphs). In 1949, tuberculin testing on a mass scale was begun and all school children and some pre-school children were done; during 1950, the majority of negative reactors received B.C.G. vaccine. Since then B.C.G. has been available for five year old school entrants and those scholars whose reaction to tuberculin had been negative and whose parents now wished these children to have B.C.G., contacts and some infants; a few other selected sections of the population have also been vaccinated. Since 1950, when a total of 83 cases of tuberculosis were notified, the tuberculosis notification rates have declined steeply and are now only about one quarter of the rates in that year.

Tuberculin sensitivity has also declined very much. In 1950, 12 per cent. of five year old children were tuberculin sensitive to 10 T.U.; in 1957, only 1 per cent. of this age group were tuberculin sensitive. The results achieved in the control of tuberculosis in Lewis thus seem to be better than in any other part of the United Kingdom. Several factors have probably contributed to this decline, but one of the main influences appears to have been the B.C.G. vaccination scheme. The proportion of the population already vaccinated is appreciable; B.C.G. vaccination, on the scale made possible in Lewis, is unique in the United Kingdom. Adequate records of tuberculin sensitivity, vaccination methods and reactions, tuberculosis notifications and details of individual cases are available. A follow-up of all persons tuberculin tested on the Island would be relatively easy.

The proportion of the total cases developing in individuals tuberculin positive to the pre-vaccination test, and the relation borne by the morbidity in this group to the total morbidity would also be of considerable interest.

A grant was given to cover the cost of the production of special cards (one enclosed), and also to defray the extra-clerical assistant's salary.

LEWIS SURVEY RECORD CARD

Surname	Address	Year of Entry 19	Case Number
		Status on Entry	

Christain Names	Parish	Sex		Date of birth	Status on Entry	
	1 2 3 4 5	M. 1	F. 2	/ /19	Contact	1
					School Child 1949/50	2
					School Entrant 1951-	3
					Other Group	4
					Tuberculosis Case 1949	5
					Known Case - 1948	6

1. INITIAL TUBERCULIN TESTS

Date	Number of Tests	Not Tested	Method				Tuberculin			Result			
			J	M1O	M1OO	MP	J	OT	PPD	Negative	+	++	+++
/ /19		1 2	3	4	5	6	1	2	3	1	2	3	4
/ /19		1 2	3	4	5	6	1	2	3	1	2	3	4

11. B.C.G. VACCINATION (PRIMARY)

Date	Not Vaccinated	Method		Preparation			Vaccine				
		I.D.	M.P.	N	Sed.	Cent.	Batch	D	F	G	G(M.P.)
/ /19	1 2	3	4.5.6.	1	2	3		1	2	3	4

111. RESULT OF VACCINATION (PRIMARY)

Normal (Observed)	1
Complicated	
Delayed Healing	2
Local Abscess	3
Gland Abscess	4
Lupus	5
Other (Specify)	6

Post-Vaccination Tuberculin Test

Not Performed	Method				Result				Date
	J	M1O	M1OO	MP	Neg.	+	++	+++	
1 2	3	4	5	6	1	2	3	4	/ /19

IV. FOLLOW-UP

Year	Tuberculin Test		B.C.G. Vaccination			Tuberculosis Follow-up	Contact
	Method	Result	Method	Preparation	Vaccine		
1949							
1950							
1951							
1952							
1953							
1954							
1955							
1956							
1957							
1958							

V. FOLLOW-UP SUMMARY

1949-1958	Tuberculin Test		B.C.G. Vaccination				Tuberculosis						
	1	2	1	2	3	4	1	2	3	4	5	6	7

NOTES

Each person entering the scheme was coded, (1) contact, (2) school child, 1949-50, (3) school entrant, 1951, (4) other group, (5) tuberculosis case, 1949, (6) known case, 1948.

For the follow-up summary, those developing tuberculosis, were coded; (1) Active tuberculosis, bacteriologically confirmed; (2) Active tuberculosis, not confirmed bacteriologically; (3) Miliary or meningeal tuberculosis; (4) Active tuberculosis in another site, (specify under "Notes"); (5) Respiratory tuberculosis requiring observation, (not notified; (6) Chest x-ray examination showing no abnormality; (7) Known to be in good health, (at time of completion of follow-up or, at latest year for which information is available.)

All tests and readings from the beginning to the end of the campaign were made by me.

The readings of the tests were made after 48 to 72 hours, and were graded as, + (5 mm. diameter induration in Mantoux test or 4 discrete papules Heaf); ++ (6-10 mm. Mantoux, 6 conjoined papules Heaf); +++ (over 10 mm. Mantoux or continuous circle enclosing raised central area with cedema).

The total number of school children taking part in the scheme was 6,822; 3,501 boys and 3321 girls, and of these totals, 2,788 boys and 2,646 girls were negative reactors.

Between October, 1949 and December, 1950, 2,104 boys and 2,024 girls were entered in the scheme, and the remainder of the boys, were 1,397 and of the girls, 1,307, came in the scheme in subsequent years on entering school.

Dr. Macgregor thought that, as the school children formed a compact group, easily definable and readily available, that analysis of the results should concentrate on them, at least to begin with.

The cards have been deposited in St. Andrew's House where the processing was carried out.

The results of this special survey are given in the Discussion.

The status codes of these children on entry, with totals, were as follows:-

	Boys	Girls	Total
Code 2 - (School children, 1949/50	1,923	1,842	3,765
Code 3 - (School entrant, 1951 onwards	1,349	1,251	2,600
Code 1 - (Contact) + Code 2	181	182	363
Code 1 - (Contact) + Code 3	48	46	94
	3,501	3,321	6,822

During the 15 months, October, 1949 to December, 1950, the participants were as follows:

	Boys	Girls	Total
Code 2	1,923	1,842	3,765
Codes 2 + 1	181	182	363
	2,104	2,024	4,128

The pupils joining in the survey from 1951 until 1958 were in the following categories:

	Boys	Girls	Total
Code 3	1,349	1,251	2,600
Codes 3 + 1	48	46	94
	1,397	1,297	2,694

The percentages found to give positive reaction in the various status codes among the school children were:

	Boys	Girls	Total
Code 2	29.0	27.0	56.0
Codes 2 + 1	41.4	52.7	94.1
Code 3	3.2.	3.4	6.6
Code 3 + 1	43.7	50.0	93.7

REVERSION

The school children were tested each year; reactors, non-reactors and B.C.G. vaccinated alike. A most interesting and unexpected, not to say surprising result, in view of the current opinion, "once positive always positive," of repeated testing of those naturally allergic was to discover that reversion was no uncommon happening. Furthermore, there could be no doubt about this changed reaction, because many of those now failing to show allergy were among those positive reactors who had been x-rayed by the Chest Physician and, having revealed intrathoracic lesions, had been ordered bed rest. Among 500 x-rayed, 32 were considered radiologically confirmed. The number reverting was 23 and 7 of these came from the radiologically positive group. (This investigation had to be abandoned on account of cost.)

A good example of reversion is seen in the case of a boy born in 1939, who gave a very marked positive reaction, (PPP) on 7th March, 1950, to 0.1 m.g. O.T. He took ill with an abdominal complaint and was removed to the

Lewis Hospital where he had his appendix removed. At the same time he was notified as suffering from tuberculosis of the mesenteric glands. (It was because of this that the boy's father had their cow slaughtered as mentioned in the Veterinary Surgeon's report.) In 1955 he was Heaf negative.

I myself had a very fierce reaction to 0.001 mg. in 1950 and, in 1953, the Heaf test was pronounced "PP" and by 1957 I was no longer allergic. I, therefore, had B.C.G. by M.P. and, when the local lesion developed, I had the Surgeon cut it out and the portion of skin was sent to the Pathologist who reported, "a typical tuberculosis lesion of the skin." Allergy followed in due course, Heaf PPP, but a year later this was lost.

In the case of three school girls and one school boy, I followed the waning sensitivity each year from 1T.U. in one case, 10 T.U. in the others, to no reaction to 100 T.U. in intervals of time of 1 to 3 years and ultimately they received B.C.G.

RESULT OF VACCINATING PREVIOUSLY ALLERGIC CHILDREN

To several of those seeming reverters, whether from natural allergy or B.C.G. allergy, I administered B.C.G. and the local reaction was accelerated, appearing within a week of vaccination. Furthermore, in several cases the accelerated local lesion was more intense than usual even going on to abscess and in these persons there appeared, at the site of the initial test, a positive reaction where none had been observed previously, and this occurred within 24 to 28 hours after the administration of the B.C.G. Presumably, the injection of B.C.G. stimulated a latent or dormant sensitivity to tuberculin. These slight abscesses required no treatment but healed spontaneously. The allergy resulting from this second vaccination, or first allergy in the case of reversion from natural infection, did not last and, if vaccination with B.C.G. vaccine was again given, an accelerated take with abscess formation (local) resulted. Even when conversion was demonstrated it rarely lasted beyond one year.

When local abscess follows after B.C.G. by the intradermal route, the teaching is that the vaccine has penetrated beneath the skin. I had quite a number of such, with delayed healing, and the scar left was over 6 x 8 mm. They are not always circular in outline. Therefore, in 1955, I selected

one hundred with scars of at least this size, they had all had B.C.G. prior to 1953 when M.P. routine was adopted, and I performed two Heaf tests on each of them, on the same fore-arm. Two Heaf machines were employed. The results were read after 48 to 72 hours.

I might explain how I came to develop this test. After using the Heaf "gun" to administer B.C.G. by multiple puncture, it was noticed that the next time it was used to perform the usual tuberculin test, those giving a reaction did so in a matter of hours. By experimentation it was found that the presence of the least trace of B.C.G. fluid on the gun caused an acceleration of the reaction. Hence, to avoid difficulty, separate "guns" were used. These experiments were carried out two years before I had heard of Hertzberg, Ustvedt, or Aanonsen.

For one test PPD (2 mg/ml.) was used and one "gun" was used for this. For the other, PPD as before and B.C.G. liquid and the other "gun" was reserved for this. (0.1 ml. B.C.G. supernatent liquid, when the organisms had settled, was added to a 2 ml. of PPD.) To the PPD and B.C.G. there was a reaction in every case and this appeared in 3 to 4 hours. In many cases this reaction was severe with oedema and ulceration at needle penetration points. To the PPD alone, again there was reaction varying from doubtful positive to decided positive, always without undesired severity.

As controls, another group of pupils were tested and this comprised 30 who were positive from natural infection and 40 who had been found non-reacting to Mantoux 1/100 in 1950 or to Heaf in 1955 and who had refused B.C.G. vaccination. All 30 allergic pupils gave positive rdactions at both test sites; PPD and PPD and B.C.G. and, here again, the latter test produced violent reaction, even within a few hours of its performance. On the other hand, of the 40 non-vaccinated, 6 now showed positive reactions to the P.P.D. and B.C.G. without any corresponding reaction to PPD alone. The remainder of this group, 34, reacted to neither test.

In many of those, B.C.G. or natural positive, the special test induration lasted for months or even a year or more and, on occasions, left scars.

My interpretation of these results is that several, at least, of those who showed delayed healing or abscesses did so because they had not been

truly negative before being vaccinated. This would not be surprising when it is recalled that many could have been reverters. I do not therefore consider that all cases of delayed healing result from the B.C.G. penetrating to the sub-cutaneous tissues. This latter does produce abscess as was proved when a syringe, which had been used for reconstituting Glaxo F.D., B.C.G. vaccine and which had been well rinsed with sterile vaccine, was used to administer poliomyelitis vaccine. Three girls, my own daughter was one, and a boy, who had had B.C.G. vaccination 5 years before, developed, after a month or two, a small raised red papule at the site of the poliomyelitis innoculation which turned to a vesicule and, ultimately, pus was exuded, healing was very slow and, even after years, there remains in each case a decided red indurated swelling. No organisms were found on bacteriological examination.

SUMMARY OF PAGES 25 to 64

Writers who have made reference to tuberculosis in Lewis since Martin Martin's time, until the mid-nineteenth Century, have all stated emphatically that this was a condition of great rarity. They put forward various theories to account for this; the most widely held being that the peat smoke in the "tigh-dubh" was the factor which conferred the immunity on the Hebridean. The witnesses at the Highland and Islands Medical Services Commission, (1912), made plain how hygienically backward the area was as well as being totally inadequately served medically; while the dwellings, they declared, were insanitary beyond words and not fit for cattle although they sheltered humans and cattle under the same roof.

An effort is made in the Thesis to trace the beginning of the epidemic and then to follow its course and extent by extracting the deaths from the Death Register of the various parishes in the Island. These extracts seem to contradict the belief that consumption was rare in Lewis, but the Registrar General's explanation of the local interpretation of this word removes the seeming discrepancy.

A likely source for the introduction of the disease to the Parish of Lochs is given as well as the result for the immediate contacts.

It is explained that bovine tubercle bacillus has never been isolated in human beings and the infrequency of the disease among cattle is made plain. After notification of the disease became law it was possible to give the morbidity rates, and consequent on the opening of a Sanatorium on the Island, a brief sketch of the treatment made possible there is given.

After 1949, when preventive vaccination with B.C.G. became possible, the carrying out of the preliminary tuberculin tests followed by the actual vaccination is described. The results of tuberculin testing reveal the widespread extent of the disease so that the positivity rate is excessively high.

A description of a special Survey is given.

PART II

DISCUSSION

PART TWO

DISCUSSION

NATURAL HISTORY OF LEWIS EPIDEMIC

The history of tuberculosis in Lewis is unique, hence the study of the
NATURAL HISTORY OF LEWIS EPIDEMIC
course of the epidemic is most valuable. The uniqueness arises from the fact that, from the beginning to the end or at least till the wave was spent and the end was in sight, the variables which have been considered important did not operate in Lewis; housing, changing population, violent social and environmental changes from industrialisation and others. In Lewis these remained constant and little or nothing was done by man to influence the attack or to hasten its decline and we are, therefore, enabled to study the natural course of a tuberculosis epidemic. From Table I we see how the epidemic rose to a peak around the beginning of the century and then steadily declined until 1950, at which date important extraneous factors did come into play; effective immunisation and effective treatment.

The lesson from Lewis is that, eventually a population acquires relative immunity, the epidemic declines. That is not to say that the other factors are not important, and these will be considered hereafter.

HOW A COMMUNITY ACQUIRES RESISTANCE

Tuberculosis is an infectious disease caused by the tubercle bacillus and, until this organism has gained entrance to the human body, the disease cannot arise. We have seen how the bacillus was brought to Lewis. The Lewisman having had no previous contact with the organism had not developed a resistance to the malady greater than that with which he was born. However, the invading bacillus produces a change in the body tissues of the person attacked and this change is easily demonstrated by means of the tuberculosis test; the unattacked person does not react to the test, whereas the tissues of the person harbouring the germ do. This positive reaction is taken to mean an increased resistance, termed "acquired". Following upon infection the subsequent course of events will depend on many factors such as age, sex, environment, nutritional state, family history and occupation and the site of lodgement of the bacilli; morbidity may or may not arise, in the majority of cases it does not, at least not now, but in the past the proportion suffering

was higher. The degree of morbidity varied from slight, with recovery, to severe with death at the end. Even when apparently slight the result of infection was very unpredictable because, in addition to the factors already mentioned, other variables influenced the outcome; for example, misbehaviour, self-neglect, alcoholism and the psychological reaction towards the knowledge of the nature of the illness.

The various authors writing a century ago and whose works have been quoted, all agreed that tuberculosis was more common among incomers to Lewis or, as Anderson Smith said, "they brought the seed with them," and this is most likely the case when we know that those coming from Greenock and Glasgow, places to and from which Lewismen trafficked, had mortality rates for tuberculosis of 659 and 614 per 100,000 respectively. (Reg. Gen. Report, 1855).

Because the mortality rate for tuberculosis has fallen to almost nil and, because the Sanatorium is no longer full of sufferers, it would not be safe to declare that there was no longer any tuberculosis in Lewis for, as all know, modern drug treatment can be carried out at home so that hospitalisation is no longer a sine qua non and the treatment cures the disease. But conclusive proof that the amount of illness is at a low level is to be found in the great decline in the positive tuberculin reactor rate. The disease cannot be in the homes of the Islanders and the children not reveal it. The infection rate is a true measure of the extent of the condition and this has dropped from 12 per cent. to less than 1 per cent. among school entrants, (5 year olds), since 1949. Indeed the positively reacting entrants are already known as contacts before coming to school

It is interesting to speculate on the reasons for the fall in the death rate from tuberculosis even before the days when any special steps were either available or taken to this end. Mention has been made in the Thesis of the various factors brought forward to account for the absence of tuberculosis in Lewis in the mid-nineteenth century, but let us look for a moment at the likely causes for its decline. From the Tables and Charts given already it will be evident how quickly the infection spread and the result must surely have meant that, around 1905-1915, almost the whole population had been in contact with open cases so that practically everyone would have given positive tuberculin

reaction, and this we know indicated an acquired resistance which, in turn, meant a reduction in morbidity followed by lessened mortality. It was almost certainly true of that period, and for a long time afterwards, that it was preferable to be a positive tuberculin reactor. The Prophit Report on Tuberculosis in Young Adults, (Daniels et.a.), 1935-44, makes and substantiates this claim. For young adults to avoid contact with open cases, (from 1895 until 1925 an average of 4 persons, mostly babies, died of tubercular meningitis each year), without doubt was difficult and, as this late contact with late conversion of allergy was fraught with danger, a negative reaction was undesirable. This active immunisation of the population in infancy was surely the reason for the fall in mortality.

Now we come to the middle of this century and we discover that to be a positive tuberculin subject is not so desirable; those likely to develop active disease are found among the young who had suffered infection in childhood. This was the view held in the United States, (Palmer and Shaw - 1953) and it is shown to be true in Lewis now. Because of the reduction in the number of active open cases it was now becoming possible to pass through childhood and adolescence without picking up tubercle bacilli. The persons presently reporting at the Sanatorium are those who had been infected as children; the organism had gained an entrance to the body and had lain dormant for years only to make its presence felt when unfavourable conditions were met.

A hundred years ago those reaching the cities from Lewis were non-infected In the city, contact with cases of open tuberculosis occurred and infection took place to be followed, in many cases, by morbidity which all too often proved fatal. Some of the morbid cases returned home, indeed were sent home, by the doctor "to recuperate in their native air"; to bring infection into areas previously free.

That was the train of events 100 years ago but I am sure that the sequence changed 50 years ago. At the beginning of this century, the Lewisman no longer left home non-infected but was rather a positive reactor who, under unfavourable surroundings, became an actual sufferer because his quiescent, or latent primary infection, broke down. That this is true of the last 20 years I believe to be proved by the following facts and I see no reason to doubt that

it had been so since the beginning of the current century.

During the War, the Ministry of Labour had a scheme under which youths of 17 years could go to war service in engineering work or shipyard work rather than wait until the age for call-up for military service. Before acceptance the lads had to have a medical examination. I was approached to undertake this examination and I gladly accepted because I was most anxious to get x-raying as many young folks as I could persuade to agree to this, (no x-ray examination was demanded by the Ministry.) Out of 32 candidates 10 were turned down because of signs of intra-thoracic tubercular lesion and 2 of the 10 actually had active tuberculosis requiring treatment, which they accepted, although no evidence of this had been noted on clinical examination. On one occasion, when the technician was up from Edinburgh to overhaul the x-ray plant, he asked me to x-ray a normal chest, as a picture free from woolly shadows made it easier for him to make adjustments. I called in a boy of 16½ years who was driving the ambulance but, when I saw the developed fil, I at once admitted him to the Sanatorium as a patient; he had no symptoms but he had an acute exudative type lesion with positive sputum.

Now the older, (18 years) men who were being called up and examined by a Medical Board had no x-ray if the Board saw no reason for such. But from the numbers discharged after some months in the Forces with active lung conditions it is evident that many ought not to have been passed for service at all. They needed but the wrong conditions of mental and physical strains and stresses and psychological turmoils provided in Service conditions for their existing focus, though dormant or latent, to break down.

Further, to reinforce this opinion I might explain that, after War II when all youths were called up under the Military Services Act, an x-ray was now compulsory for everyone. I had been conducting a tuberculin sensitivity survey of school children and I had my lists of everyone tested with his (or her) reaction noted. Invariably those rejected after x-ray, (not now done by me nor under my direction), and put in Grade IV by the Medical Boards were found to be positive reactors. Although not sufferers and not notifiable, it was now being recognised that the rigours of military training would almost certainly lead to a breakdown of the quiescent focus. There seemed no point in causing illness and then being obliged to allocate a pension. The number

rejected was 24. They remained at home and were kept under periodic supervision; three of them required bed rest for several weeks. Like the pre-servic boys they all kept well. Unfortunately I do not have a record of the total number of youths called to the Forces and the Ministry of Labour do not now have these figures. The proportion Grade IV, (after x-ray) was very high.

Another indicator is to be found in the fact that all those under 25 years of age who left Lewis since 1950 to work or to study and who have been notified from Mainland towns, (a total of 6), as suffering from tuberculosis, have been known to me as tuberculin sensitive before setting off. There is but one exception, a girl, a contact of her mother, had B.C.C. from me just before going off on the aeroplane to Glasgow to enter a Glasgow hospital for training as a nurse. I do not know whether her B.C.C. brought about conversion as I never saw her again. She was notified from the hospital in Glasgow and is the sole vaccinee to develop tuberculosis.

These figures given about pre-service boys, boys called up under the Armed Forces Act and emigrants, although small, are not obtained from selected groups but relate to the total population of Lewis and appear to me to be significant and could well be applied to what happened in Ireland at the time of the migrations, 1851 onwards, to refute the arguments of Osler and Hamer, and support Lindsay and Newsholme, (Reference 47.)

ISOLATION OF LEWIS

While early observers, (Martin Martin, 1695); Register General, (1855); Morgan, (1860); MacCormac, (1860)) agreed that tuberculosis was very rare in Lewis a century ago, we see from the death registers that there was more than was realised by the physician but less than the records would indicate, an anomaly which is clarified by the Register General's explanation of the Gaelic Registrars' interpretation of the term "consumption" as a cause of death.

The Lews was late in being attacked by tuberculosis because of its isolation. Comings and goings with the mainland of Scotland, where the disease was very prevalent, (Reg. Gen. Report, 1855 - Insular District, 237 per 100,000, 285 mainland, (rural), 515 in Towns) were few.

It has already been pointed out how long and tiring a journey it was to reach Lewis. It was also expensive and, to get to the remote villages, was

exceedingly difficult. Inter-village communication was difficult when I came and is still only practicable for car owners. In the nineteen-thirties, after reaching Stornoway, if one wished to reach another township one had to travel till midnight or later by bus. It was no use staying overnight in Stornoway hoping to continue the journey in the morning because there was no transport out of Town until the mailboat arrived in the evening. Buses came from the country in the morning and returned in the late evening after meeting the mailboat. Today the position is the same.

The geographical situation of Lewis, it would appear, delayed the arrival of the tubercle bacillus, since the dates when each of the various parts of Great Britain suffered their maximum attack show us a steady out-reaching to the circumference; thus England, 1838-42; Scotland, 1871; Ireland, 1890; The Lews, 1905. Once Lewis was reached the internal difficulties of village intercommunication meant that the disease was at first confined and the parishes did not all experience their peak attack at the same time. The graphs which I have prepared of the parish mortality rates show this.

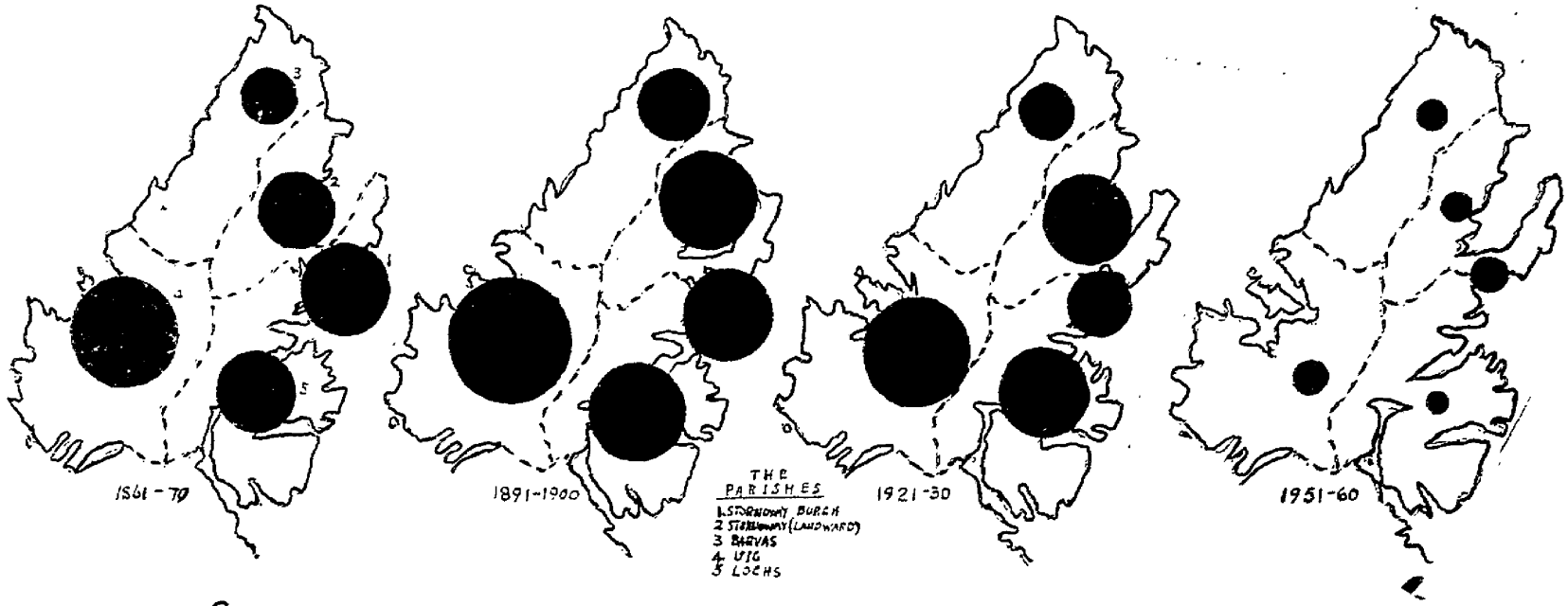
Uig, as was already noted, suffered its attack early 1865 quite endependently of Stornoway Town which was early affected although 10 years later. These two localities had fishing boats from the Mainland coming into their areas: Uig had the higher death rate. The Landward part of Stornoway Parish soon followed the Burgh since it was possible to get into and out of the Town fairly easily because of its close proximity.

Lochs Parish, to the south of Stornoway, was within easy sailing distance and boats from this Parish came into Stornoway with their catch, but the wave did not reach its crest in this area until the beginning of this century.

The Parish of Barvas, on the other hand, was distant from Stornoway and, furthermore, its coast was very exposed and devoid of safe haven for fishing fleets, consequently there would be few fishermen and women gutters visiting these parts after having made contact with cases of phthisis.

The women fish-gutters, who came from remote areas, had to find lodgings in Stornoway for the season and the lodgings were greatly overcrowded. The women slept on the floor, ten or more in small rooms without any sanitation.

1 RESPIRATORY TUBERCULOSIS in the BURGH of STORNOWAY and the PARISHES in LEWIS.
2 ALL FORMS " " " " " " " "



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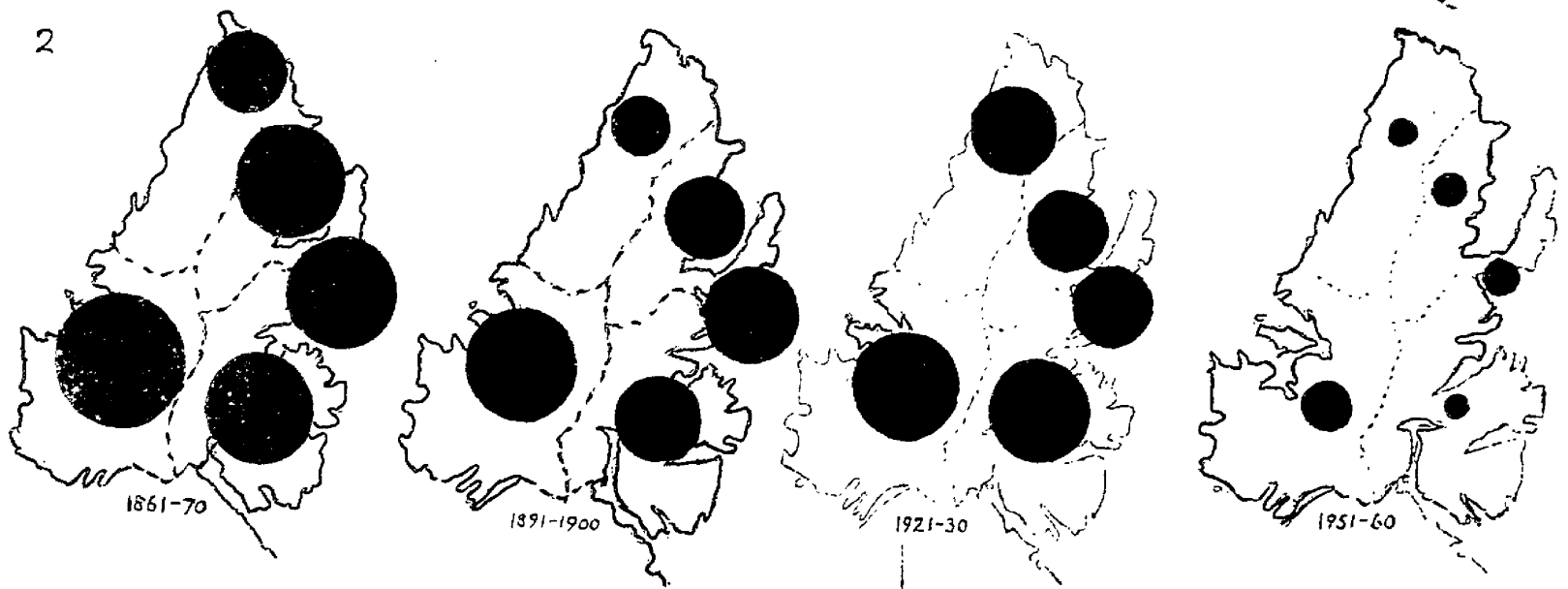


SIZE of DOTS based on the √average death-rate per 100,000 for the 10 year periods. Radius of circles = √DR. in mm.

RACIAL FACTORS - CELTIC TYPE AND NORDIC TYPE IN LEWIS

Attention has been drawn to Morgan's (1860) reference to racial factors as a possible explanation of the rarity of consumption in Lewis one hundred years ago. There is no doubt about the great difference in the mortality rates of the Parish of Lochs as compared with Barvas Parish and, as the racial characteristics differ greatly; Celtic in Lochs Parish and Nordic in Ness area, such a possibility springs to mind. Morgan could not have data of comparative mortality rates as given in this table.

Average Annual Death Rates per 100,000 for Respiratory Tuberculosis in the Parishes of Lochs and Barvas in decennial periods

Decennia	Lochs		Barvas	
	Male	Female	Male	Female
1895-1904	339	207	150	125
1905-1914	367	139	163	101
1915-1924	201	217	165	117

From the Encyclopedia Britannica I took this definition of "Celt" - "much confusion has arisen from the inaccurate use of the terms 'Celt' and 'Celtic'. It is the practice to speak of the rather short and dark complexioned Celtic-speaking people of France, Great Britain and Ireland as Celts, although the ancient writers seem to have applied the term 'Celt' chiefly to folk of great stature with fair hair and blue or grey eyes." For the purpose of this thesis, 'Celt' has the modern meaning of a short, dark, Celtic-speaking type.

WALES AND LEWIS COMPARED

In Wales the type of the disease and also mortality therefrom was observed to be different in the two races, Celts and Norse. Bowen, E.G., (1929)[35] describes the difference in clinical type of tuberculosis in the differing races; the Celt developing the "acute" or "young adult" type of lesion, (Brownlee, 1918)[34], while the Nordic element contracted a more chronic or modified type with death at later ages. Moreover, the Nordic element was less frequently attacked. He describes how, when the coal mines in S.E. Wales opened up, many came from the remote parts of Wales to work as miners and they

had to live in terrible conditions. In 50 years, half the population of the Principality had gathered in one county. Strangely, he says, industrial Wales did not suffer from "acute" or "young adult" disease although the typical miner was of Celtic extraction.

Even stranger was Bowen's finding, after a detailed investigation into the anthropology of a Glamorgan village, where this acute type predominated, that 75% of those dying in 1902-1927 were Nordic in features. His conclusion was that the Celt, while prone to "young adult" form of the disease in his native mountains, was more resistant, when in the industrial area and the reverse was the case with Nordic types. He mentions that Lyle Cummins and Charles Lloyd carried out a detailed study of the epidemiology of tuberculosis in a Cardigan lead mining area extending over 50 years, (1876-1926), and their conclusinns were similar to his own.

Brownlee, (1918), from his interpretation of tuberculosis statistics, found it difficult to see how young people could develop "young adult" phthisis in towns since this acute form was found in the country as opposed to the towns. This coincides with Bowen's views. Brownlee further stated that rural immigrants to the cities were better able to stand the conditions of city life than the natives. This he deduced from Chalmer's Report (1913)[37] in which he discussed the relationship of birth-place to frequency of notification of phthisis in Glasgow in 1911.

The mortality rate varies between one area and another even in the same county; e.g. In 1950, the rate in Renfrewshire was 54 per 100,000 while Greenock had a rate of 83 per 100,000. Differences in the degree of overcrowding, unemployment and other socio-economic factors are perhaps involved. But here in Lewis, in the case of the two parishes mentioned overcrowding and other relevant factors were exactly similar and today are still the same. But one cannot unreservedly assume racial differences as the explanation of the contrasting rates. The configuration of the land must have played a part; Ness has a rocky exposed coast so that no Mainland boats called there. MacCulloch (1891) says that the Ness men were bold fishers "but their market was a personal one." Lochs, on the other hand, sheltered and fostered fishing crews from all parts.

The graphical representation of the rates in each parish shows clearly that the rate for Barvas was persistently lower than in any other parish. The census returns do not break down the sex and age groups for parishes, hence it is impossible to calculate sex-age specific rates.

DIET AND NUTRITION

Morgan (1860) said of the diet of the Lewis people, "a diet composed in great measure of oleaginous substance is held by some to be almost specific in preventing tubercle of the lungs. Under this category the fish diet of the Hebrides cannot be comprehended. It contains in general but small amounts of oil, the oleaginous part of many fish not being eaten. In addition to herring, cod, ling, skate are being constantly met with, but the oil in these varieties is confined to the livers which are melted down to supply oil for the lamp." This, I may say, is quite contrary to my experience but then, prior to the introduction of paraffin oil, fish liver oil may have been used. Indeed an old lady of 94, on my questioning her on the subject of fish liver oil and its use, recounted a Gaelic saying heard in her youth; "Who would eat the light?" (meaning the source of the light and then be left in the dark.)

My experience since 1930 until the present has been that the natives eat fish liver and its oil. Most delicious, nourishing and greatly relished dishes are made with the cod's liver, such as "cropic head" in which the liver is mashed with oatmeal and onion and stuffed into the cod's head which is boiled. It is very tasty and nutritious. A famous Island doctor told me that when he was a boy and the fishermen set off in their rowing boats to go fishing, they took with them home-made oatmeal or barley bannocks between two of which they placed the liver of the first cod caught. This sandwich was wrapped in a suitable protective covering and laid on the seat. The rower then sat on top of it so that the oil was expressed and absorbed into the bannock. This was their meal.

Even at the present day people love fish liver. It is not legal to sell fish ungutted but the local fishers still sell the fish whole and, in a recent court case for infringement of this law, it was explained to the Sheriff (not a Lewisman) in defence that the purchaser did not wish the fish without the liver. When I came, and for many years thereafter, the local chemists bought livers and extracted and sold the oil in Stornoway.

Whether a specific or not cod liver oil is a most valuable abjunct; it is included in the Welfare Foods for expectant mothers and babies because its rich content of vitamin D ensures good dental and bone development. The uptake of the welfare foods was not very great here and the Ministry of Food desired me to instruct mothers to make more use of cod liver oil but I informed the Ministry that Lewis women preferred to give their infants the natural, freshly-extracted oil as had always been the custom. It was this excellent diet of fish, fish liver, milk, eggs, butter with home-made barley and oatmeal cakes, home-made "crowdie" (a curd cheese), that produced the well-known excellent dentition of the Lewis people. King (1940) carried out research studies on this subject for the Medical Research Council and published a monograph on his work. He found Lewis school-children to have the best teeth in the United Kingdom.

Because of the sound, if rude, diet which the Islanders have enjoyed since I came, the notes of Anderson Smith in Lewisiana (1875) and information given me by natives, I at first assumed that the diet of the Islanders had always been of this standard. But as we have seen from the findings of the various Commissions; Sir John MacNeill, 1851; The Crofters' Commission, 1883; the Poor Law Magazine on Destitution in the Hebrides, 1883; the Report on the Condition of the Cottar Population in the Lews, 1888; the Report of the Crofters' Commission, 1904, there were periods of marked food shortage. Further, these times of scarcity came after the introduction of the tubercle bacillus and, from the diagram illustrative of the course of tuberculosis in Lewis, we notice how the wave mounts after these deprivations until it reaches its maximum, (243 per 100,000) early in this century, 1905. The rate was now one of the highest in Britain, Scotland as a whole having a rate of 218 that year.

I was taught that the Islander was more prone to tuberculosis than the Lowlander. Lewis had a peak rate of 243 per 100,000 in 1912 while Scotland reached 386 in 1869-71 and England 442 in 1838-42; for Glasgow, the rate is 614 in 1855 going on to 668 in 1871. Lewis in that same year had 92 per 100,000 as its tuberculosis death rate. If we follow the figures through the years we see the Glasgow rate fall steadily whereas the Lewis rate rises so that, in 1921, Glasgow is down to 145 and Lewis is 226. Accepting that the

give some idea of the actual state of affairs, should we not look for a much higher rate in Lewis if the people were more prone to tuberculosis? That the rate, far from getting worse, improved spontaneously would seem to suggest a greater rather than a lesser degree of resistance and, here the Islanders' constitution, as modified by the experience of tuberculosis, played a major role. And in the up-building of the human constitution, diet is a most important factor and we have learned that, apart from the periods of failure of the fishing and of the crops, he enjoyed a good diet. In 1922, Professor Cathcart of Glasgow University carried out investigations into the diet and found it very good; this was in connection with the finding that rickets was almost unknown in Lewis. I have never seen a case.

The contrast between the mortality rates for Glasgow and Lewis for a period of years is shown in this table; the rates are per 100,000 and are supplied by the Registrar-General's Office.

	Glasgow	Lewis
1931	118	133
1941	145	91
1942	140	83
1943	138	57
1944	140	91
1945	133	119
1946	132	112
1947	126	124
1948	126	174
1949	113	64
1950	95	64
1951	69	64

It will be noted that, between 1931 and 1941, the Glasgow rate has risen while, in Lewis, it fell. This seems to me to be significant and to have a bearing on the question of nutrition. The thirties were notable for the mass unemployment when thousands were forming queues at Employment Exchanges and many of the poor in Glasgow were living on bread, potatoes and margarine; dejection was everywhere, the masses were dispirited. The Lewismen were short of money also but not of food. I came here in 1930 and I saw how they had milk, butter, eggs, chickens and fish in plenty. Those who had been South and were now at home out of work were not hanging around the street corners down-hearted and anxious about food for their families, but were engaged on

their crofts and gathering peat for winter warmth. The declining death rate continued in Lewis until 1943, whereas, in Glasgow, the raised rate was steady until 1944 after which there was a progressive fall. In Lewis, on the other hand, a rapid and pronounced increase took place, but most of this increase was brought about by returning service men and munition workers who were now suffering from tuberculosis.

I hope it has been shown, when dealing with infection, that many of these unfortunate people had, in all likelihood, latent lesions when they set off from Lewis and that they broke down under the adverse conditions. We noticed in the Thesis how 33 per cent. of the cases notified between 1940 and 1949 were service men and women.

PEAT SMOKE AND VENTILATION

It has been mentioned that Morgan gave to the peat smoke the credit for the rarity of tuberculosis in his time and this view had also been put forward by Willis. MacCormac (1868) likewise considered peat reek innocuous, but for him the "black house" with its continuous ever-changing air was the essential factor favouring relative immunity to the people. Professor Noel Paton believed that ventilation was quite satisfactory, (Glasgow Med.Jr., March, 1922). Likewise Gibson (1938) claimed that the black houses were well ventilated through the roof so that there was no stagnant air. Had more care been taken in selecting a suitable site and in the alignment of the walls so as to throw off the rain water, and had opening windows been provided, he believed the black house would have been the most suitable type of house for the climate. With an infantile mortality rate of 28 per 1,000 births in 1923, compared with Edinburgh's 82, Glasgow's 90 and Aberdeen's 104, he thought the black house could not be as "black" as it was represented to be; also note that babies in Lewis were not put out of the black house until 18 months old.

I agree with Gibson that an improved black house could be an excellent dwelling, but fashion in architecture changes and it would not be generally acceptable. However, there are a few in some villages which have been modernised. No one would agree that the old style black house, with its all-purpose room, was at all suitable; indeed I am convinced it was the factor above all others responsible for the rapid spread of infection.

It was no uncommon experience for me to visit an advanced case living in such an all-purpose room where milk would be exposed to the germ-laden spray expelled by the sufferer, and that another bed in the room would be occupied by children. The conditions existing in many black houses were worse than those arising in the Aurehoej State School in Denmark, (Irvine 1954)[37], where the girls were taught by a lady teacher suffering from acute tuberculosis in a badly ventilated, permanently blacked-out cellar, because, in winter, the Lewisman slept in almost permanently blacked-out and often grossly infected dwellings. The conditions in Lewis meant that the epidemic could not be other than explosive.

Morgan (1960), declared peat reek to have beneficial effects other than those on the lungs, because of its content of tannin, tar and creosote: "It is impossible to witness the pools of stagnant water and impurities of all kinds that lie in rich profusion about the houses without a strong conviction that, either the baneful effects of putrid exhalations have been grossly and slanderously exaggerated by sanitary reformers, or that here, at any rate, there exists some beneficient agent capable of neutralising and controlling them." Morgan was writing about conditions 100 years ago and he did not foresee that phthisis was going to get such a hold in Lewis despite the continuance of peat as the only fuel in the same black houses. However, the advocates of the virtues of peat smoke say that the rot set in when chimneys began to be built in the black house. Gibson (1924)[38] and Paton (1922), were talking of conditions of housing and sanitation in the twenties of this century which had changed little when I came to the Island in the thirties. Black houses, situated on crofts with the water supply drawn from wells, in no way protected from contamination, were common. That more serious results were not forthcoming, even in my time, I consider is explained by the fact that croft houses are, unlike tenement buildings, seperate one from the other and crofters had their own milk supply and often their own water source. Today there are gravitation water supplies and sewage disposal.

Peat reek may not have all the beneficient properties ascribed to it by Morgan, MacNab and MacCormac but, on the other hand, I cannot agree that it was, in any way, detrimental to health. There appears to have been remarkably

little pulmonary phthisis among children. On the other hand, between 1885 and 1954, 116 deaths of children under 5 years are recorded as having been due to tuberculosis and, of these, 87 are entered as tubercular meningitis w while the remainder, 29, were allocated to different sites, mainly non-respitory.

AGE INCIDENCE

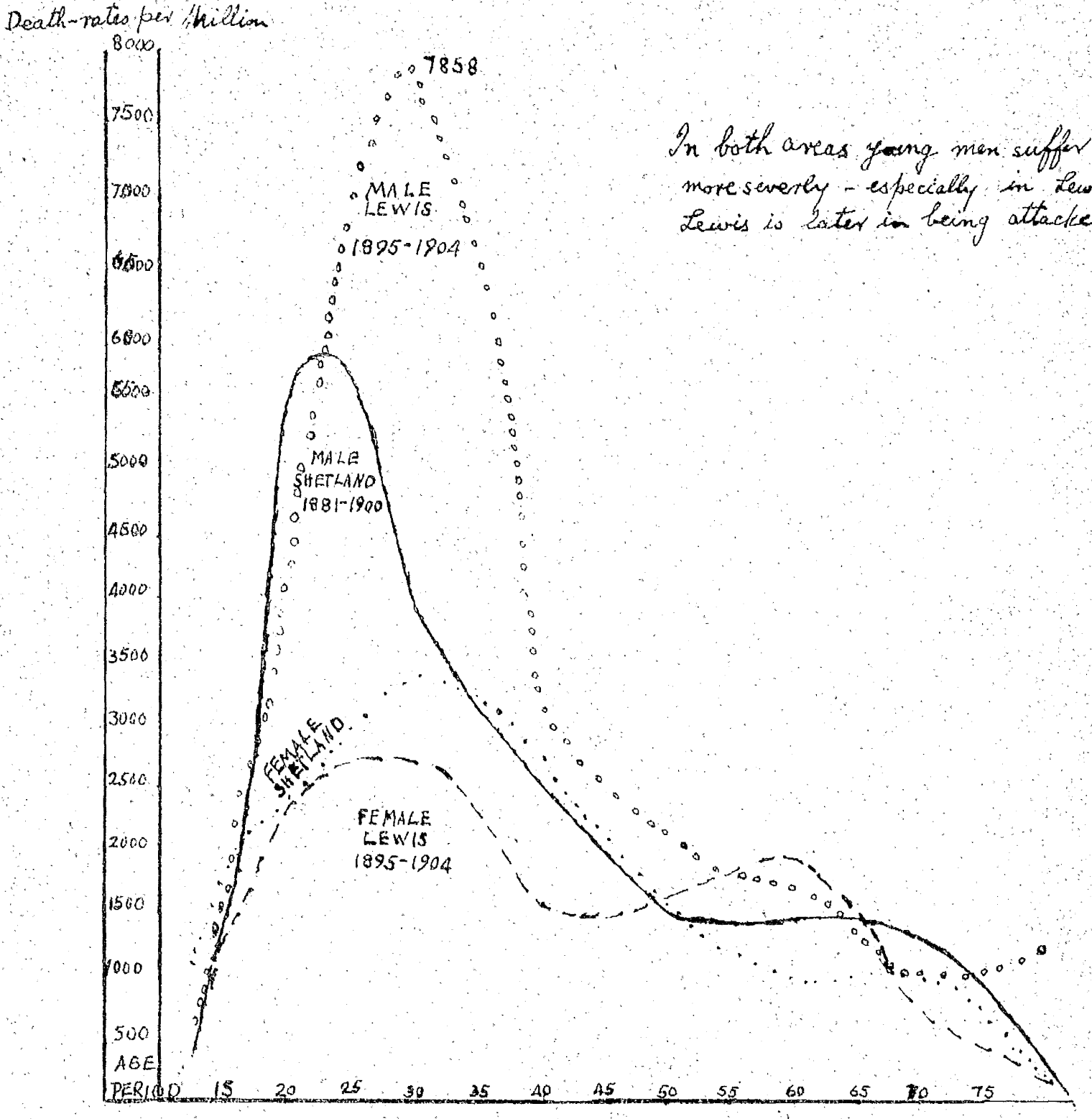
It was noted how, in the early years, many deaths of old people were registered as "consumption." Rather would we expect in a freshly beginning epidemic, as indeed we get, the high "young adult" death rate noted by Brownlee, (M.R.C. Reports, 1918-20).

This "acute" type becomes more pronounced as time passes and reaches its peak around 1905 at which time it was truly a devastating disease for young men between 25 and 35, carrying them off at the rate of 785 per 100,000 and young women at half this rate.

As will be seen, when the Lewis graph is compared with Brownlee's for Shetland, that there is a great similarity between them. His graph for North Wales is of the same type. There is a difference in time, however. Lewis was comparatively free of the epidemic when Shetland and Wales were suffering badly and, when Lewis was mounting to its peak rate, North Wales was falling to less than half its maximum over a period of thirty years.

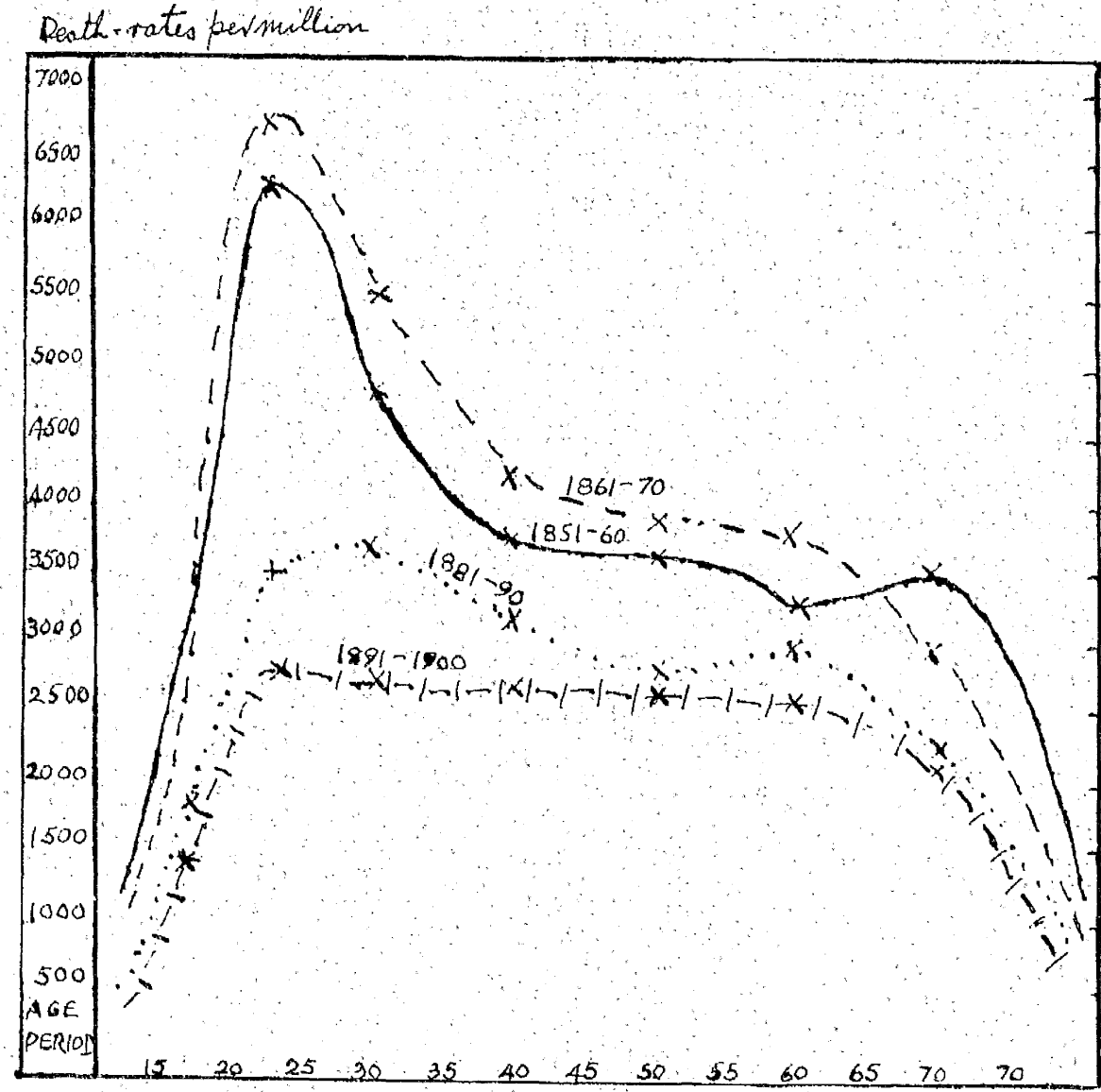
MacKinley in Table VII of "Decline of Tuberculosis Death Rate", Reg. Gen. 1935, [40] indicates that male deaths are at a peak at age 25 to 35 years in the Highlands and Islands, while the Industrial Areas have theirs' at 35 to 45 years and Central Scotland between 45 and 55 years, and this progressive postponement of the age at death indicates a longer period of contact with tuberculosis in the latter areas.

Diagram XIV. PHTHISIS DEATH-RATES SHETLAND 1881-1900
(from BROWNLEE-1918).



In both areas young men suffer more severely - especially in Lewis. Lewis is later in being attacked

Diagram IV PHTHISIS DEATH-RATES NORTH WALES 1851-1900
MALES from BROWNLEE - 1918



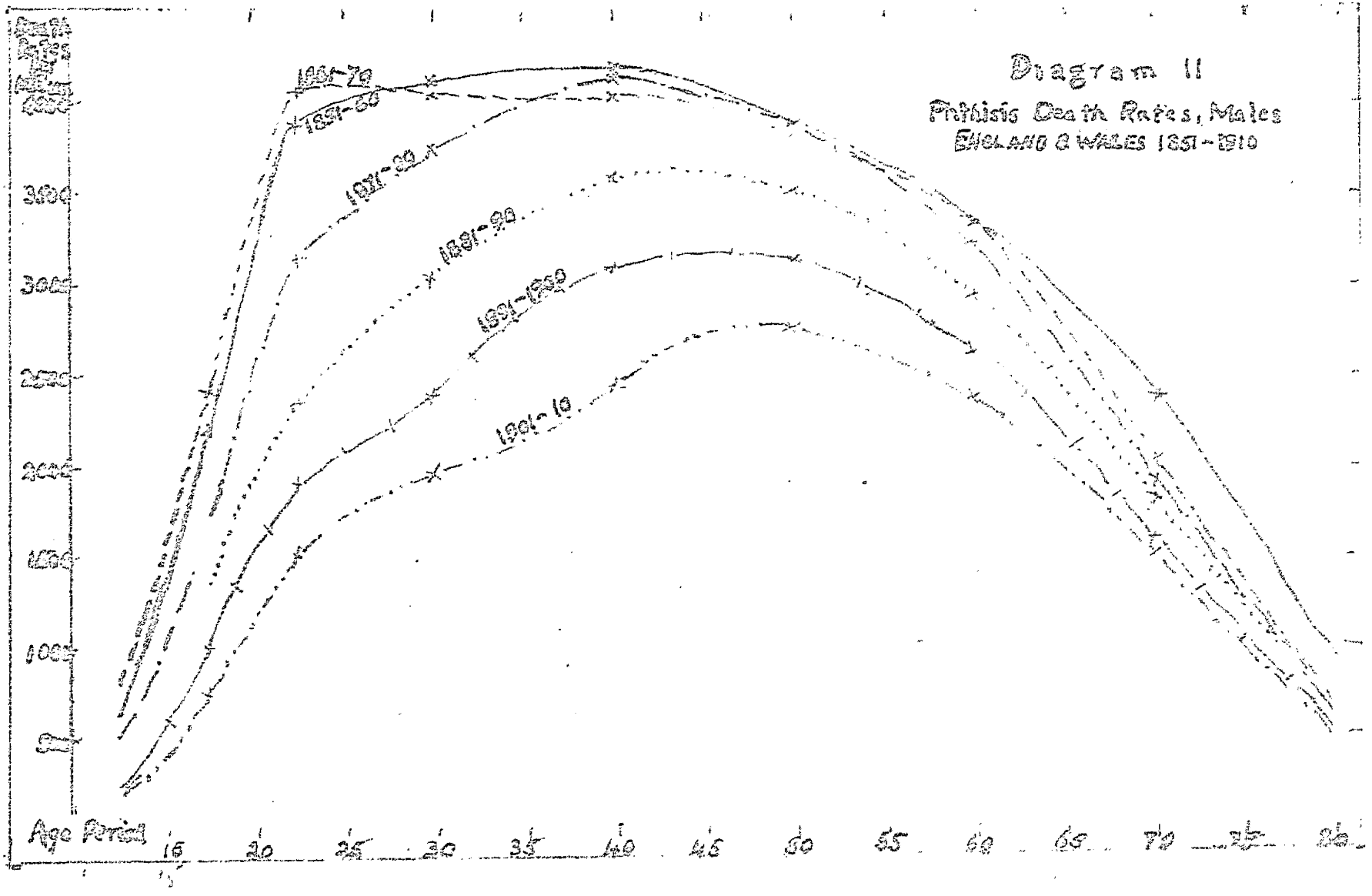


Diagram 11
Phthisis Death Rates, Males
England & Wales 1851-1910
1851-70
1851-60
1861-70
1871-80
1881-90
1891-1900
1901-10
3000
2500
2000
1500
1000
500
Age Period
15
20
25
30
35
40
45
50
55
60
65
70
75
80

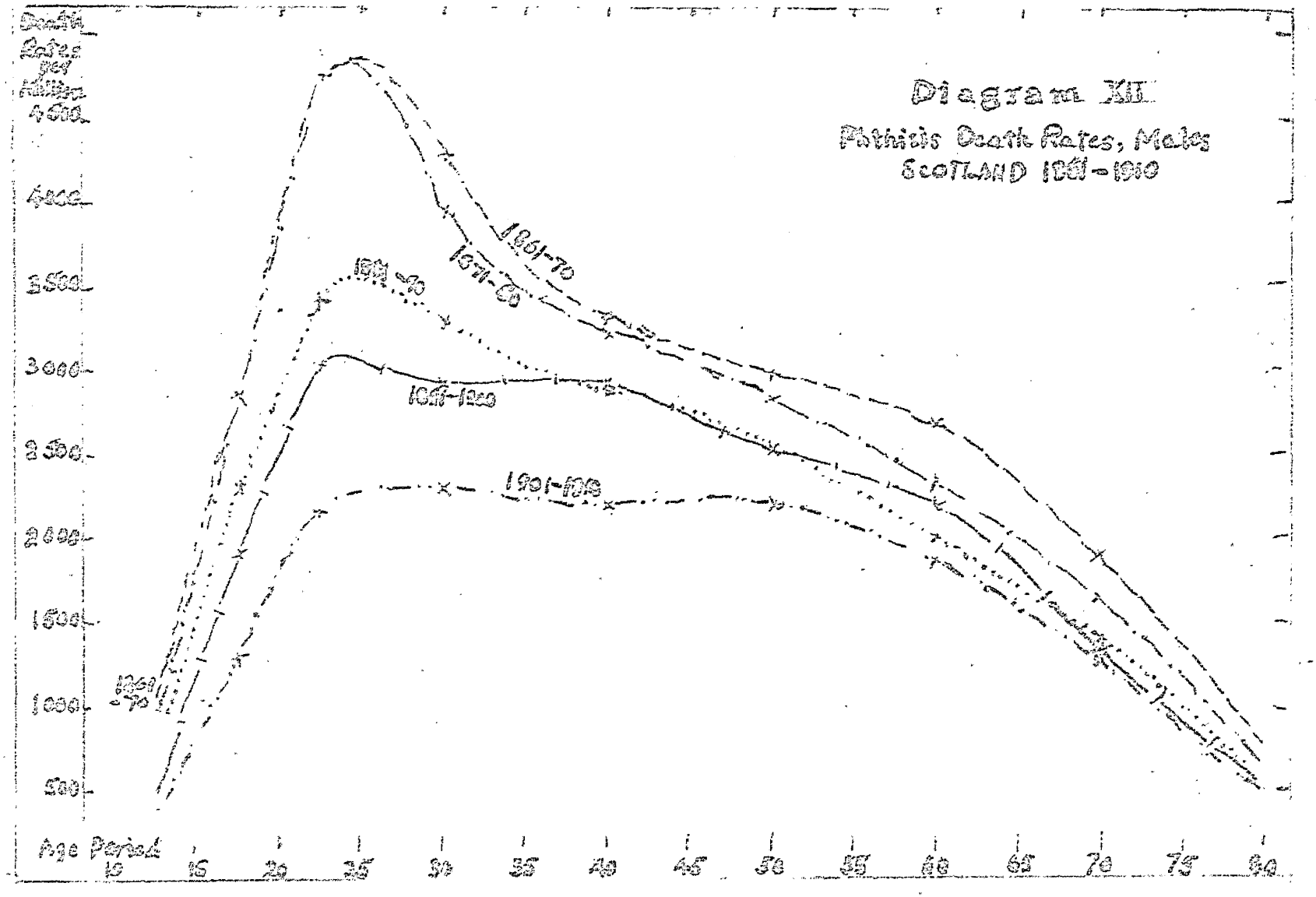


Diagram XII
Phthisis Death Rates, Males
SCOTLAND 1861-1910
Death Rates per Million
4500
4000
3500
3000
2500
2000
1500
1000
500
1861-70
1871-80
1881-90
1891-1900
1901-1909
Age Periods
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80

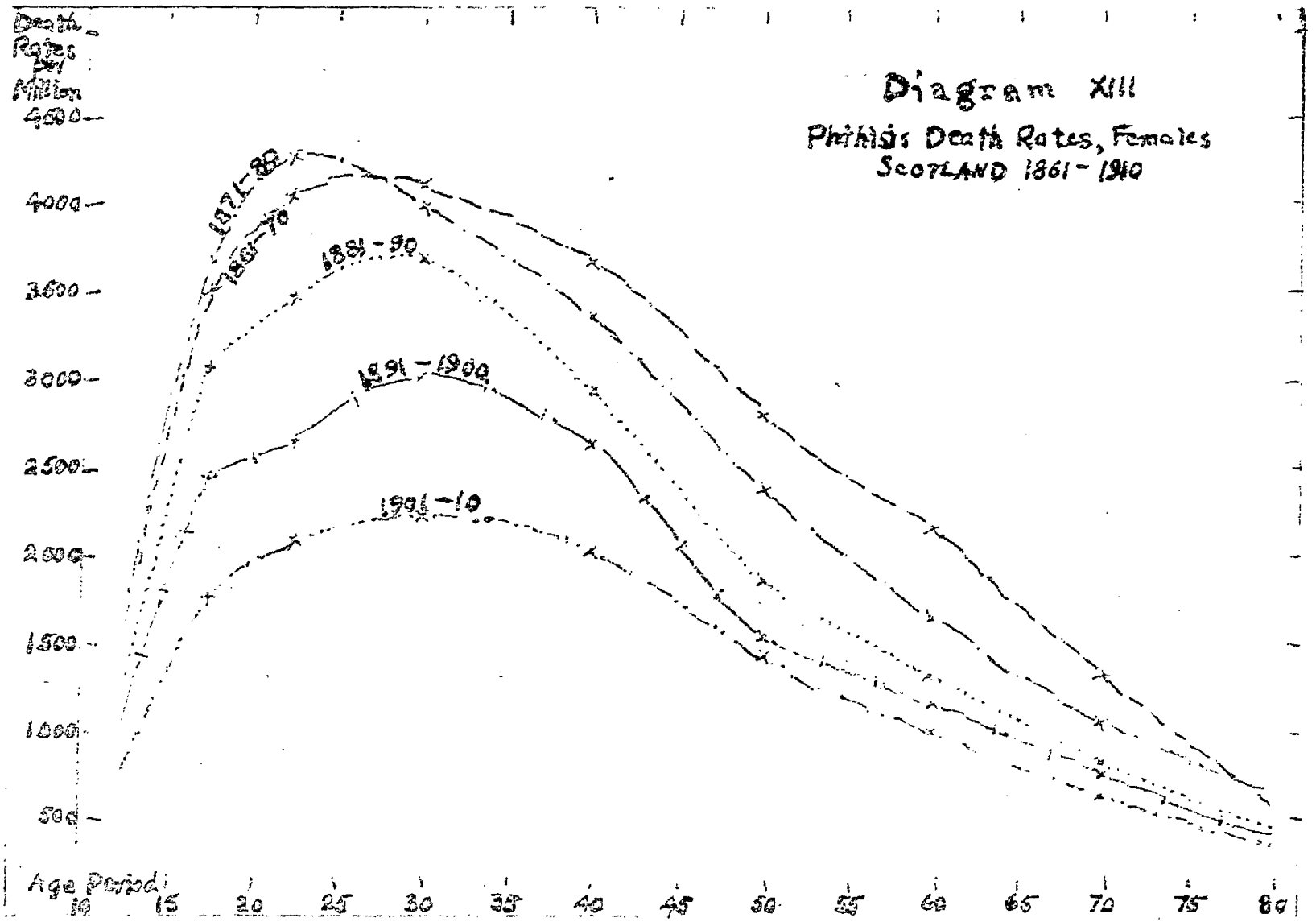


Diagram XIII

Phthisis Death Rates, Females
Scotland 1861-1910

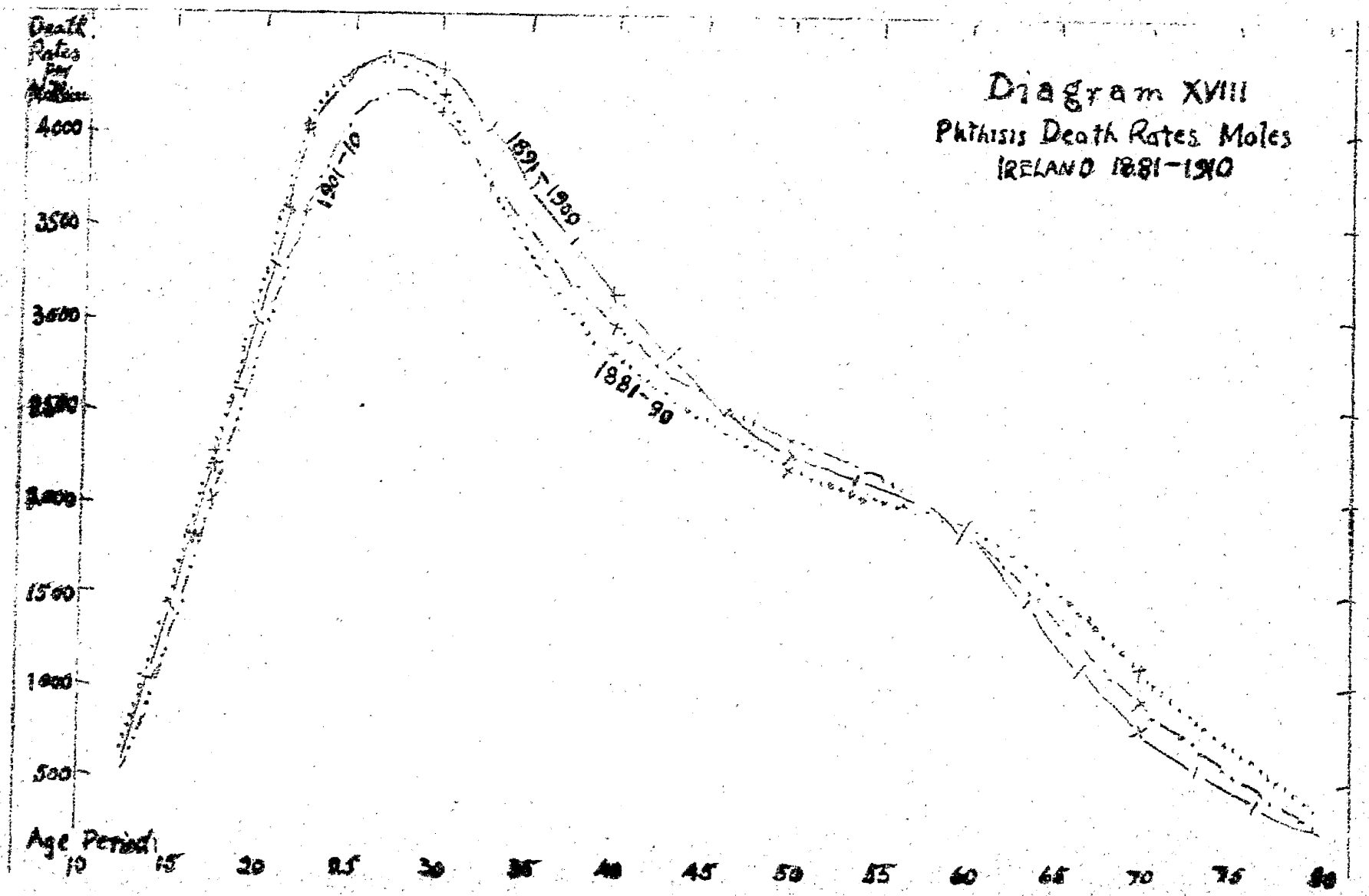


Diagram XVIII

Phthisis Death Rates Males

IRELAND 1881-1910

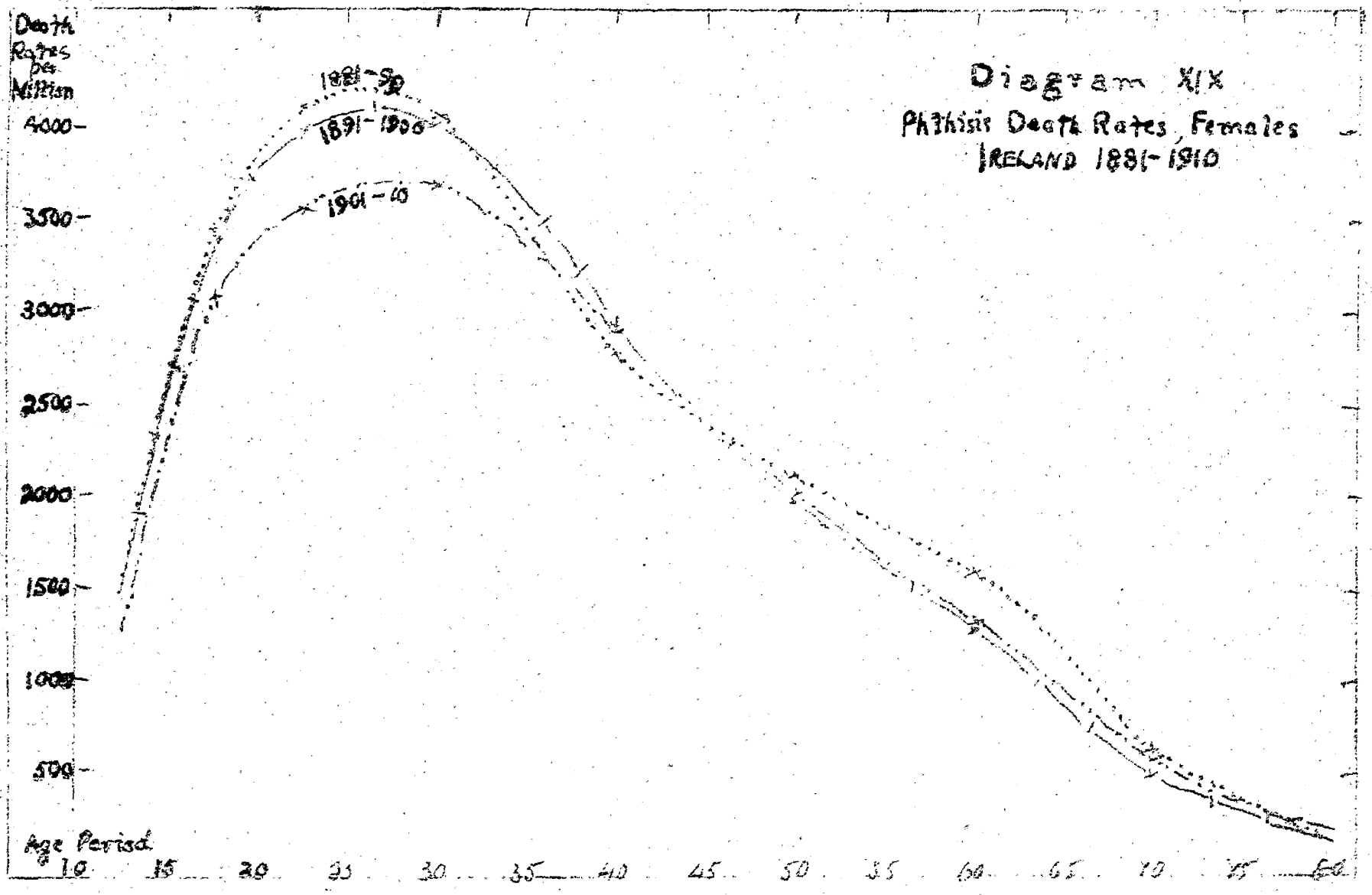


Diagram XIX

Phthisis Death Rates, Females

IRELAND 1881-1910

TABLE OF SEX-AGE SPECIFIC DEATH RATES FOR AGE PERIODS 25-34, 55-64, and 75+ IN LEWIS IN DECENNIA

The rates are annual averages per million

Decennia	AGE GROUPS					
	25-34		55-64		75+	
	M	F	M	F.	M	F
1865-74	2326	1578	1459	1565	1498	1948
1875-84	5025	2477	2842	1149	3043	1488
1885-94	5352	2743	1589	993	1342	-
1895-1904	7858	2685	1728	1998	1227	226
1905-14	7243	2467	1913	906	1070	196
1915-24	4542	3640	1890	1051	514	167
1925-34	4758	2841	1041	896	728	307
1935-44	2676	2479	1149	476	418	-
1945-54	2504	1370	900	400	738	-
1955-59	380	144	54	268	-	-

This table of death rates for males in successive decennia from 1865 until 1954 and for the quinquennium 1955-59, for age groups 25-34, 35-64 and 75+ reveal the following changes: (1) A rapid advance among the young men (25-34) reaching its maximum about the beginning of the century, followed by quite a decided fall. (2) For men 55-64 years, the rise was slight and the fall was equally gentle with even an increase in over 75 age group in the decennium 1945-54. This latter trend is in keeping with the tendency throughout the whole country. (3) For women 25-34 years, the peak was reached twenty years later than in the case of men, viz: 1915-24, while between 1925-34 girls of 15-24 years had the high rate of 3,222 per million, (not in the table.

An important feature in the course of a tuberculosix epidemic is shown in Brownlee's North Wales graph, namely, how mortality in the older age groups, while declining, does not do so at the rapid rate of the younger age groups and this causes flattening of the curve. From Brownlee's graph for England and Wales we get a glimpse in the 1901-1910 curve of what was later the experience of Scotland, and Lewis is now following the same pattern, viz. diminished

youth group mortality with comparatively less fall in the older group mortality rates. In the graph for Lewis we note no death under 20 years of age for the years 1955-59.

The character of the England and Wales curves demonstrated to us how long the disease had been established, because the 1851-60 curve shows its peak among the 40+ years for males and the 30+ years for females, with a higher rate for females, 4,500 per million against 4,100 for men. By 1901-10 the male rate is down to 2,600 with the 50 year olds suffering most and among females, the 40 year olds have a rate of 1,200 per million. Ireland is later in being attacked and his curves for Ireland resemble those for Shetland, North Wales and Lewis. The improvement in the Irish death rate is seen between 1881 and 1910 but it is slight in comparison with the drop in the Welsh rates. The Irish death rates for phthisis remained raised with but little improvement between 1881 and 1907, while the rate for all forms rose from an average of 1,900 per million, (1870-1875) to 2,300 per million in 1901. The disturbing factor, intensifying the fatal results, is given by Sir R. Matheson, Register General, as "the return of Irish Americans and migrating labourers from England."

J. Stewart MacIntosh (1912)[41] gives a picture of conditions existing in Ireland in 1860-80, and these have a bearing on the rise in phthisis death rate at this time. "In the notoriously congested districts, groups of cabins are dotted haphazard over the countryside and inhabited by listless scarecrows, clad in rags. Here famine and pestilence hold perennial sway and only those who have seen the full development of these plague spots in the remote promontories and peninsulas of Connaught can believe that such places could exist within the confines of the British Isles." The rate for Lewis also rose rapidly during this period; to 1,500 per million. Ireland and Lewis had more recently encountered tuberculosis.

In the Tuberculosis Journal of N.A.P.T., Vol.1 1900, North Wales is stated to have a higher phthisical death rate than any county in England and Dr. Peter Fraser, M.O.H.[42] for Carnarven, blames the living conditions with over-crowding, 4 to 5 adults living in a small ill-lit, ill-ventilated room. The theory then and now, (Cf. Prophit Report, 1949), was that a Celt, whether Scottish, Irish or Welsh was more prone to tuberculosis. Fraser gives the respiratory death rate for 1881-90 as 2.89 per 1,000 males and 3.04 for females.

In Volume II of the same Journal, in 1903, anxiety is expressed that Ireland should still be so badly affected. Comparative rates are given to show that there is a higher female respiratory death rate in Ireland and U.S.A., thus,

Average Mortality per 10,000

	England and Wales	Ireland
1870-75	24	19
1880-85	19	21
1895-1900	14	21
1901	13	23

Average Mortality per 10,000

	England and Wales		U.S.A.		Ireland	
	M	F	M	F	M	F
1880-90	18	16	30	32	20	22.1
1891-1900	15	11	24	19	21	22.1

	Glasgow	Paisley	Dublin	Belfast
1880-1885	31	27	31	39
1896-1900	20	18	32	33

Comparison of rates for Scottish and Irish cities.

The writer mentions expectoration in railway carriages and on city street pavements in explanation for the increase in Irish towns. I suggest the true explanation is that the disease was introduced later to Ireland and the epidemic was waxing, and continued to do so, until the majority of people had been infected and so had their resistance increased. Professor Lindsay (1908), wrote, "we must not admit that the Irish race have any racial tendency to tuberculosis" and he adds that if certain individuals (Irish) in America suffer beyond the average of their races, "we should be inclined to blame, not exactly their racial characteristics, but rather the condition of life under which they live in U.S.A." Lindsay's dictus would be applicable to Lewismen who went to work in the cities, not with regard to housing but rather in relation to their diet and to the physical, mental and spiritual disturbances occasioned by the change.

DECLINE IN MORTALITY RATES

A look through any of the Register-General's Reports at the tuberculosis mortality tables for either England and Wales or for Scotland since 1855, shows

how there has been more or less steady lessening of these rates. However, from the "Proceedings of the Royal Society of Medicine, 1913,"[44] it is evident that, at that time, the fall in tuberculosis death-rates was not accepted as genuine or, at least, doubts were expressed as to its reality.

Theories advanced in explanation of the fall were; change in nomenclature - decline, consumption, phthisis, pulmonary tuberculosis. Hamer, President of R.S.M., considered migration played an important part in the seeming fall. England, Germany, Denmark, Belgium and the Netherlands were showing a decline; France, Italy and Switzerland were, more or less, stationary, while Ireland, Norway and Hungary were apparently increasing. Sir William Osler thought "the drainage from Ireland, by emigration, of the healthy" was largely responsible and the most important single cause.

Sir R. Matheson, in his address to the Conference, said, "Emigration has removed the able and the healthy and thus left amongst the residue an increased percentage of the enfeebled and persons less able to withstand the attack of disease." But was it the healthy who left Ireland in the great emigrations from 1851 onwards? Newsholme quoted figures from Providence, Rhode Island, to show that the "Irish there had a 31 per cent. higher tuberculosis mortality than the Irish in Ireland in 1907."

There was no medical examination of the emigrants. Many were far from being in good health as a result of the famine conditions prevailing in Ireland at the time. Reasoning from my experience of tuberculin testing and x-ray examination in Lewis I would consider that among those leaving Ireland would be many persons already infected with possibly quiescent foci which would break down under the strain of the physical and mental upheaval aggravated by unfavourable conditions in America. As Matheson explained, many of these dejected and dispirited sufferers returned home to augment the Irish death rate and spread infection. This is what happened in Lewis following the World Wars.

The shift of the phthisis death rate to the older age groups during the preceding 3 or 4 decades, Hamer stated, was simply explained by the emigration of the younger people. We see the shift to older persons in the Statistics for Scotland and England and it has become more pronounced.

In Lewis, the course of the epidemic has been a perfectly straightforward one, not influenced by such factors as migration en masse, and yet we observe a true fall and a change in the age groups suffering the highest mortality rates, viz: a change from young adults to the more elderly section of the population.

Brownlee, (1918), had evolved a theory founded on statistical evidence, to cover the difference in the age groups most severely affected in one part of the country as compared with another part. Thus, for the "young adult" form of phthisis he considered the organism producing it to be different from that which led to the death of older age groups. He considered "Phthisis among young people is a disease of the country, not of the town," and he found it difficult to see how young people could contract "young adult" disease in the cities since this form of tuberculosis was not there. From comparisons of the number of cases of scarlet fever notified in the better class districts and in the poorest localities of Glasgow with the number of tuberculosis notifications for these areas, and also with those of the country as a whole, he declared, "There is little doubt that a considerable part of the decline in phthisis in recent years is in line with the biological properties of disease in general, and has little to do with hygiene." The rise and fall of the epidemic wave in Lewis, under the conditions described, would appear amply to confirm that declaration. We now know there is but one human tubercle bacillus and it has the same virulence now as ever. Animal inoculation tests do not reveal any change in virulence powers.

A.K. Chalmers, (1913), dealt with the fall in the phthisis death rate in Scotland between 1860 and 1910 which he put at 57 per cent. This 57 per cent. reduction he said was associated with the shift of the intensity of attack from industrial to agricultural counties. Further, this great decline was not entirely due to improved sanitary conditions nor was it due to a change in the constitution of the population as regards the numbers living in the different age groups since the number comprising the 15-45 years group remained almost stationary at 44 per cent. between 1861 and 1891. This 15-45 age group is the one most affected by morbidity. From the study of the Registrar General's returns, he deduced that the death rate from phthisis between 1861 and 1910 fell by an average of 60 per cent. in the industrial

by
counties and only 30 per cent. in the pastoral ones, and goes on to say "the urban drift was from populations susceptible to phthisis as is illustrated by the County rates then prevailing even in our remoter islands."

The inference here is that, since the rates in the remoter islands were high at this time, (around 1905-1910), the Lewis rate was now at its zenith, that the people there were tuberculosis prone. This view seemed to him to be proved by his investigations into the birth place of 2,477 notified cases in Glasgow in 1910 (M.O.H. Annual Report, 1911) when it was revealed that twice as many cases occurred among non-natives, many of Island extraction, as among those born in Glasgow of Glasgow parents. However, from the particulars which I have given in connection with infection and notification rates, (chart), among the young people of Lewis, I feel that it is more likely that this higher notification rate among immigrants (from the Islands) to Glasgow arose as the result of persons with latent lesions breaking down under the unusual environmental and psychological and spiritual changes, rather than that the first infection took place in Glasgow.

The fact that the graphical representation of the causes of the disease in Lewis, where it ran its course 50 years later than it did in England and Wales, should show the same form as depicted by Brownlee even when it was left uninfluenced by man's interference, would suggest that epidemics have an inherent pattern which can explain the incidence in the sexes, and in age groups, far better than the other factors put forward, namely, spitting on the pavements, differences in local hygiene, migration, variation in the virulence of the bacillus, improvement in sanitary conditions, the differing type of disease in towns as opposed to the country and even the incidence of morbidity in Glasgow.

HUMAN AND BOVINE TUBERCULOSIS

Martin Martin, (1695) remarked on the infrequency of scrofula in Lewis. Morgan, (1860) told how an immigration officer rejected numbers of persons on account of signs of scrofula. Smith, (1873) declared that strumous conditions were very prevalent on the mainland. Macdonald, (1873) refuted Smith's statement about scrofula being a common cause of death among children. In my search of the registers I observed scrofula as a cause of death not

more than half a dozen times, (in the Parish of Lochs) in all the Lewis deaths during the century. On the other hand, from the Registrar-General's Reports for Ross-shire Mainland for 1891-1900, scrofula deaths were 90, 52 male and 38 female. When I came to Lewis in 1930 there were a number of young people in the Sanatorium and others who attended a clinic and who had been to Sanatoria in the South and who had many scars around knees, hips, ribs, fingers and on the neck, but there were not many new cases after 1930. The incidence, as judged by notification, fell. It was from the 20's onwards that crofters were being helped by the Board of Agriculture to build "white" houses and in these there was a scullery where milk could be kept instead of in the living-room/bedroom, where there might be a sufferer from pulmonary tuberculosis. In this way contamination of milk was much reduced and there would be that amount less ingestion of tubercle bacilli. Since scrofula existed in Lewis but did not prove fatal, while the reverse seems to have been the case on the Mainland, one is tempted to think that the infection by the bovine tubercle bacillus must have been more severe than that by the human type bacillus, the only form of the organism found in Lewis.

Of the cases of tabes mensenterica, (32 male and 31 female notified during my time here), only 3 male and 1 female died. Annually, deaths from meningitis averaged 4 during the years 1895 to 1925. From 1938 onwards, where a specimen could be obtained in cases of non-pulmonary tuberculosis, including meningitis, bacteriological typing was done but, in no case, was the bovine type of organism recovered, only the human type. Blacklock, (1936) gives statistics to show the frequency of morbidity caused by the bovine bacillus. This was the causative organism in 80 per cent. of cases of abdominal tuberculosis, in 35 per cent. of bone and joint disease and in 64 per cent. of cervical glandular disease.

Brownlee, (1918) gives interesting figures for the number of milk samples with the percentages positive for tubercle bacilli sent to London from different Shires during the years 1908 to 1914: he also gives the death rate for under 5 year olds from tubercular meningitis and tabes mensenterica for the years 1901-1910. The average number of milk samples positive was 10.4 and the average meningitis death rate - 70 and that for tabes - 60.

These figures contrast strongly with those for Lewis and, in an indirect way, seem to confirm the absence of bovine tuberculosis in the Island.

TUBERCULOSIS AND ENVIRONMENT

The leading article in the B.M.J. of 16th March, 1957, includes this passage: "It might well be supposed that bad housing would increase the risk of general respiratory disease and, at the same time, lower resistance through poor nutrition, mental depression and the like. Yet it is by no means easy to find unequivocal evidence that such conditions make for increased incidence of tuberculosis. One method of study is to correlate a series of towns or counties according to their tuberculosis death rate and their over-crowding index. Investigations of this kind have often failed to show any significant relationship between overcrowding in the home and the death rate from phthisis. Familial contact rather than numerical crowding is the factor of importance. Even in studies of the actual Housing conditions found among persons diagnosed as tuberculous there is apt to be a conflict of evidence. In Edinburgh, (1950) and in Glasgow, (1952), Lili Stein made a careful analysis of well defined localities, each of which was comparable in such respects as overcrowding, type of tenant and economic situation. Her results showed a close association between overcrowding and respiratory tuberculosis."

"Most epidemiologists would stress the importance of Topley and Wilson's comment. 'The spread of tuberculosis in the community is in great part the result of slowly progressive household epidemics which often lead to the transmission of the disease by contagion from one generation to another.'"

Common sense would lead one to accept the first sentence of this quotation as true. With the second I feel that it is necessary to disagree and declare that there is an unequivocal connection between bad housing and the incidence of phthisis in Lewis. It is impossible to think it could be otherwise. Imagine a house of virtually one room almost completely in darkness occupied by from 6 to 12 persons for many hours each day and one of them bedridden with active respiratory tuberculosis, ejecting tubercle bacilli into the confined space, and one or more of the other inmates also suffering although not yet bedridden, the expectorated organisms falling on to the earthen floor, there to dry and then to be wafted up with the dust into the air, inspired

by any occupant or visitor for months or years to come since this floor could not be washed! Surely here numerical overcrowding is of equal, if not greater importance than familial contact.

Topley and Wilson's statement aptly applies to Lewis. There was no isolation of the cases and before the end came the patient might have lain for months or years spraying out bacilli, and the dust from the earthen floor must have contained the contagium to take the disease to other generations.

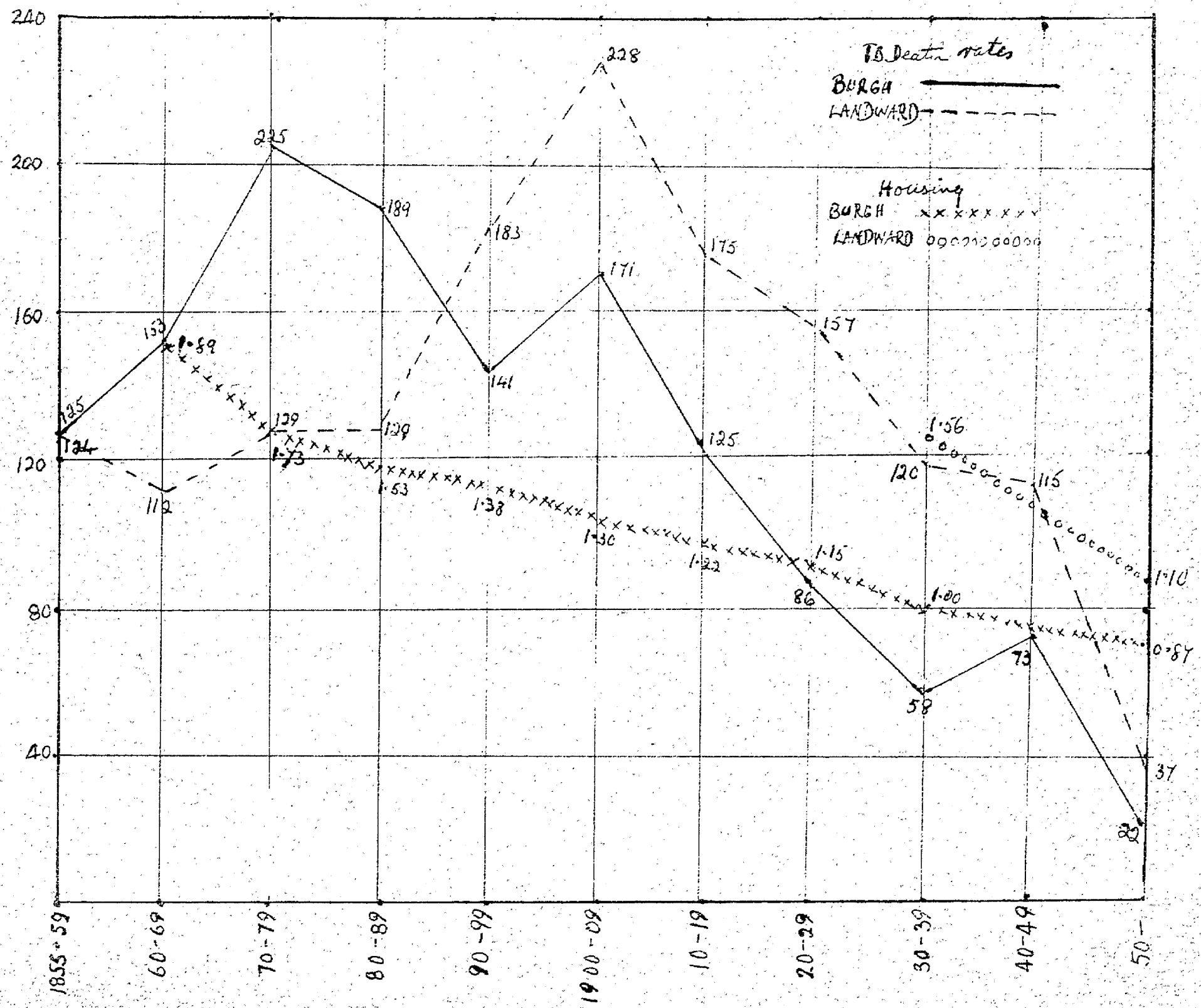
The people seemed to realise this in some dim sort of way and, although the custom of burning the infected house was no longer practised in my time, it was still common practice to burn all bedding and personal clothing of the deceased.

It is difficult to ascertain the relationship between the number of occupants of houses and the mortality rates because the required data was not given in the census returns. I have prepared a graph showing this relationship: in it the Stornoway Burgh figures are compared with those for Stornoway Landward.

Brownlee, (1918) quotes Chalmers, (1913) on the relationship between the phthisis death rate and number of apartments in the house.

Size of house	Phthisis death rate (1910-12 males)
1 room	1.69
2 rooms	1.30
3 rooms	0.94
4 rooms	0.77

It has been suggested that, even where there is a large family living in a large house, all the family must meet at times during the course of the day. This is undoubtedly so, but surely the opportunities for becoming infected are infinitely greater in a one-roomed house where the sufferer eats and sleeps with all the other members of the family. The dosage of bacilli picked up by the family members in a black house greatly exceeds that likely to be received in a house of many apartments and, if the degree of morbidity is dependent upon the number of organisms entering the body - see Prophit Report, 1948-54 - then the overcrowded black house must yield a higher morbidity, and mortality, rate.


TB Death rates
BURGH
LANDWARD
Housing
BURGH
LANDWARD
240
200
160
120
80
40
225
228
189
183
175
171
157
141
125
125
124
112
139
129
120
115
110
86
73
58
37
22
1·59
1·73
1·53
1·38
1·30
1·22
1·15
1·00
0·87
1·56
1855-59
60-69
70-79
80-89
90-99
1900-09
10-19
20-29
30-39
40-49
50-

Tuberculosis and Housing in Stornoway Burgh and Stornoway Landward.

STORNOWAY BURGH.

Period	Total	Yearly Av.	Population. Census	D.R. per 100,000	Persons per room. Census
1855-59	15	3	2391	125	-
60-69	40	4	2608	153	1.88
70-79	52	5.2	2535	225	1.59
80-89	51	5.1	2693	189	1.49
90-99	48	4.8	3386	141	1.42
1900-09	66	6.6	3852	171	1.35
10-19	46	4.6	3806	125	1.30
20-29	35	3.5	4079	86	1.28
30-39	22	2.2	3770	58	1.15
40-49	32	3.2	4362 (Av. of '31 & '51)	73	-
50-	8	1.1	4954	22	0.95

STORNOWAY (LANDWARD).

Period	Total	Yearly Av.	Population Census	D.R. per 100,000	Persons per room. Census
1855-59	35	7	5666	124	-
60-69	68	6.8	6060	112	-
70-79	90	9	6975	129	-
80-89	99	9.9	7696	129	-
90-99	154	15.4	8413	183	-
1900-09	208	20.8	9131	228	-
10-19	169	16.9	9632	175	-
20-29	146	14.6	9287	157	-
30-39	100	10	8346	120	1.56
40-49	93	93	8091 (Av. of '31 & '51)	115	-
50-	20	2.9	7837	37	1.10

	Population in private Households.	Persons living per room.			
		Not more than 2	2-3	3-4	More than 4
Stornoway	4580	4291	247	32	10
Lewis	18,380	15868	1920	482	110
Ross & Cromarty County	57,105	52140	3907	844	214

	Percentage of population living per room.			
	Not more than 2	2 - 3	3 - 4	More than 4
Stornoway	93.7	5.4	0.7	0.2
Lewis	86.3	10.5	2.6	0.6
Ross & Cromarty County	91.3	6.8	1.5	0.4

Source - Registrar General's Census Returns.

The graph and the tables on which it is based show how the death rate falls with the steady reduction in the number of occupants per room.

Bradbury, (1933)[47] accords poverty the chief place among factors showing statistical evidence of evil effects on tuberculosis. Poverty opens the way to overcrowding and undernourishment and these two play very important roles in predisposing to tuberculosis. Bradbury had been comparing industrial centres of Jarrow and Blaydon on Tyneside. In Lewis strangers might have found what they would have called poverty owing to the poor habitations and the absence of furnishings but, nevertheless, undernourishment was never a marked feature; overcrowding was. Its effect was aggravated by the confinement of the family in the one room during the long winter evenings.

Bradbury lists as likely predisposing factors favouring the development of tuberculosis such conditions as lack of sanitation, bad ventilation, dirt, damp, house-to-tenant infection. This latter played no part in Lewis since the crofter owned his own house and did not let it out. His conclusion was that no definite evidence was found of their importance as causes of tuberculosis, nor do they seem to have played much part in Lewis, at least after extra resistance had been acquired.

A PSYCHOLOGICAL FACTOR?

An undoubted element favouring a fatal termination of the illness among the Islanders was the feeling of shame or guilt which not a few of the patients exhibited when visited in their homes after having been notified. Some appear to look upon their illness as a punishment for wrong-doing. This led to a desire to conceal the true nature of their sickness and engendered the idea that a fatal termination was to be expected. "I'll die in my bed rather than to the Sanatorium," was an expression frequently uttered. Those of a more sanguine temperament, however, accepted treatment, unfortunately, their hopes were not always fulfilled.

On non-pulmonary tuberculosis Bradbury makes this comment, "The incidence of this was very high in Jarrow in 1930. With the adverse conditions of life which prevail as regards housing, it requires no great use of the imagination to regard the excessive pulmonary tuberculosis of Jarrow as the cause of the excessive non-pulmonary tuberculosis." This statement would seem to apply most fittingly to Lewis, since only the human type of organism was found and this must have come from the lungs of human sufferers.

RETARDATION OF DECLINE IN MORTALITY

As occurred in all epidemics, we have seen the declining death rate in Lewis and it is noticed that the drop is not steady but suffered a retardation during and after World Wars. In England and Wales and Scotland there was emerging a tendency to an increase among young adults, most noticeable in young women, at this period. D'Arcy Hart and Payling Wright made elaborate and exhaustive studies of the social conditions and social changes in England and record their findings in "Tuberculosis and Social Conditions in England," N.A.P.T. 1939.[4#]

Such changes in social conditions did not touch Lewis. Here the people still had a good diet and Cathcart, (1923) considered it very satisfactory. Those items considered to have prophylactic value against phthisis still comprised the major part of the diet, so that nutritional changes recorded in England were not matched in the Island. Also housing, if anything, was on the up-grade.

Hart, (1939) quotes Stocks to the effect that nutritional shortages might lead to delayed deleterious effects: "He was now inclined to think that we have been witnessing a temporary aftermath of the shortage of fats, vitamins or other essential factors in diet during the years of food shortage, 1916-18, which may have resulted in lowering the average resistance to tuberculosis as these children have been coming to adolescence and young adult life." This does not satisfy Hart since, he says, young females were showing the check to the decline in mortality some ten years before the War began. In Lewis, this 15 to 24 age group, among females, did not participate to the same extent in the improvement as did the corresponding male age groups before the First World War. And females, 10 to 14 years, experienced a marked increase in their group mortality rate prior to the same War. The Lewis females, aged 15 to 24, had a much increased rate in the decade 1925-34. Hart found that the improving mortality figures for young men suffered its set-back later, in 1915, that is during the War rather than pre-war. The course of events for young males in Lewis was the same.

The slowing up of house building is suggested as playing an adverse part, but this was not so in Lewis. Housing was actually improving, if only slowly.

The differing male and female rates, he believes, may be a matter of sex constitution and, in support of this view, he quotes Putnam, (1927) who considered it a biological fact. From the League of Nations, 1931, Report it is clear that in all countries girls of 10 to 14 years of age have a higher incidence of disease than boys of this age. These points are supported by the semi-logarithmic charts showing the Lewis mortality death rates.

Hart, looks at the possibility of a reduction in the tuberculin positivity rate among young adults, as one of the reasons for the increased mortality rate. He rejects this as a factor of any significance. However, Dahl, (1933), basing his argument on the difference in allergic reaction rates in two tuberculin surveys in Trondheim, in 1914 and 1930, declares this to be a direct proof in favour of the idea. Once again Hart is unconvinced. It would seem that this explanation could scarcely be applicable to Lewis because the mortality rate among young adults in Lewis was near its peak around this time and, surely, an already high and still mounting death rate would be accompanied by the rising positive reaction rate.

ICELAND AND LEWIS COMPARED

The articles in the B.M.T. a hundred years ago, (1860 to 1864) dealing with the rarity of tuberculosis in Lewis, led to correspondence in the Journal and, in May, 1964, reference was made to a similar paucity of cases in Iceland and mention was made of the visit of investigation carried out by Schleisner at the request of the Danish Government in 1849. Although Schleisner's report is no longer obtainable, Sigurdsson, (1948)[50] quotes freely from it. Schleisner tells us that, in 1849, there was little tubercular disease among the natives, although the condition was common among foreigners.

"An experience which deserves attention is that Icelanders, who come to Denmark, fairly often acquires symptoms of consumption, particularly when they have been suffering from measles. Among 57 patients, I found 9 whom one would at first have thought to be suffering from phthisis. They were all more or less hectic, had had haemoptysis with purulent expectoration which, in some cases, contained small hydatids ..... I am convinced that the majority listed in the mortality records of clergymen as dying from 'consumption' belong to this group."

Iceland, like Lewis was off the beaten track and very isolated. Again, as in Lewis, intercommunication between the similar coastal hamlets and townships was very difficult. Thus it is that the peak period of mortality was not reached until 1925 to 1930. It was then 217 per 100,000, 177 in males and 219 in females. By 1945, it had fallen to 68 per 100,000. It is strange that Iceland, which had bad houses and times of starvation when large numbers died, should not have experienced a higher death rate. Naturally some areas suffered more than others, but 307 per 100,000 was the greatest that any district showed. Reykjavik never exceeded 160 per 100,000. Northerners do not appear to have suffered to the extent that Southerners did. Sigurdsson claims that the epidemic was spread in association with the development of the fishing industry and the improvement of communication.

Just as in Lewis, bovine type tubercle bacillus was never isolated. Dungal is quoted: "Up to January 1st, 1946, 827 strains of tubercle bacilli have been cultivated here. None of them was of the bovine type." On the other hand, the avian type has been demonstrated in hens and sheep. Hens, when attacked, have been mown down by the disease in a short space of time, but in cattle and sheep it appears to be benign. In Lewis, the avian type is very plentiful among the cattle causing a benign skin growth. At the time of writing, I am told by Mr. Munro, the Veterinary Surgeon, that while he was carrying out post-mortem examination on hens which had died he found the livers of many grossly infected by avian tubercle bacilli.

The tuberculin positive rate amongst school entrants in Lewis in 1949 was 12 per cent. and had fallen to 1.0 per cent. by 1957. In Iceland, a tuberculine survey between 1941 to 1945 yielded a positive percentage of approximately 1 for children 0-10, 4 for 10-14 years and 5 for 15-19 age groups. Fuoroscopy in Iceland, (excluding Reykjavik) during 1940 to 1944, revealed active cases rate of 8.3 per 1,000 examined, while "in 1939, 27.5 per 1,000 of the population were reported as new cases." Sigurdsson, (1948) by his charts shows that in Iceland young girls had a higher mortality rate than boys of similar age. But in Iceland females of all ages, young and old, were more vulnerable than males, and in this respect differ from Britain and America.

CHANGES IN THE INFECTION RATE

As was noted, the rate of positive reactors in Lewis changed rapidly, one might say precipitously, between 1949 and 1957 dropping from 12 per cent. to 1 per cent. among school entrants. Macgregor, (1961) gave the changing figure for Scottish school leavers between 1952 and 1959 in the following table.

Results of Tuberculin Tests of School Leavers in Scotland, 1952-59

	1952	1953	1954	1955	1956	1957	1958	1959
Number tested	8,843	31,447	59,352	48,319	58,803	57,577	42,546	58,316
Negative Reactors No.	3,860	16,378	37,626	32,857	42,144	41,838	31,643	46,466
Negative Reactors %	44	52	63	68	72	73	74	80

In the preface to the Prophit Report, (1948) Lord Moran states: "Judged by the tuberculin test, there should be a rapid diminution in the proportion of positive reactors, such as has occurred in Minneapolis where, among school children, there was a fall from 47.4 per cent. in 1926 to 7.7 per cent in 1944, and only 10 per cent. of young adults now react positively to the test instead of the corresponding 85 per cent. in this county."

THE DIFFERENCE IN URBAN AND RURAL REACTOR RATES

In the Prophit Report the difference in the ratio of reactor to non-reactor in urban as opposed to rural areas is noted, and also the tendency for the urban positive reactor to have a higher degree of sensitivity than the reacting rural dweller.

Similar divergences were observed in Lewis. The Nicolson Institute is a Senior Secondary School catering for those pupils taking advanced courses and they come from all parts of the Island to study there; they live in hostels and lodgings. As mentioned in Professor Heaf's notes, not only was there a higher reactor rate but the intensity of the local reaction was enhanced in several children from rural areas as compared with their previous response to the same tuberculin concentration. In addition, conversion was not uncommon among rural pupils already known to be negative in the village schools.

Alikely explanation for these observations may be found in the fact that all patients from all over the Island required to come to the clinic

at the Sanatorium. While in Stornoway many stayed with relatives and there was much visiting done in the homes. Casual contact in buses and shops must have been common.

The difference in the infection rate as between town and country has also been observed in U.S.A. and the writers of the Prphit Report quote the result of tuberculin tests in students, 19 years of age, in American Universities and Colleges; "47 per cent. reactors in Atlantic States, 40 per cent. reactors in Pacific States and 27 per cent. in Central States. It is probable that, as in Denmark, these much lower proprtions of reactors in humans are related to the eradication of tuberculosis in cattle, which was first achieved in the Central States."

Since no bovine type of disease existed in Lewis the fall here can only mean a tremendous fall in the infector pool in Lewis. I think it should be noted that the reduction in the reactor rate had begun and was well established before the introduction of chemotherapy.

THE VALUE OF CHILDHOOD INFECTION

From what has been written above it becomes necessary to examine again the value of infection in early life. One can no longer claim that such infection is beneficial at all times and in all places, and circumstances alter the eventual answer.

Daniels, et. al., in the Prophit Survey,[43] deduced from very substantial evidence that the non-reactors developing tuberculosis out-numbered the reactors doing so by 3 to 1. Palmer and Shaw, (1953)[51] showed that among children and adolescents the reverse was the case, and this is in keeping with the results of this Thesis. However, as Macgregor, (1957-58)[58] points out, the Prophit Survey was carried out on nurses and students as the greatest risk of contacting sufferers, whereas the others dealt with persons not specially exposed.

A point worthy of note is the conclusion reached by the M.R.C. in 1963 that, as time passed, the incidence of disease among the reactors to tuberculin, regardless of its strength, weak or strong, diminished so that there was little difference between them. Furthermore, seven and a half to ten years after the commencement of the Survey it was discovered that the group

which had initially reacted positively, had lower morbidity rates than occurred among those initially negative. This seemingly paradoxical swing back to a higher incidence of lesions among the tuberculin negative, as revealed in the M.R.C's last Report,[54] is not so likely to apply to Lewis. The M.R.C. drew their clientele from the cities in England where an infector pool might persist because of refusal of many people to submit to investigations, whereas, in Lewis, such is not likely.

Griffith, et.al., (1963)[55] remarks on the paucity of new cases arising among those who had high grade reactions 12 months previously; thus the rate per 1,000 examination fell from 8, at the first test, to 0.8 after 12 months among those previously positive.

It should be possible in Lewis to come nearer a definite opinion as to whether the advent of tuberculosis in older people is the result of new infection or results from the breakdown of lesions developed in school days, but safely overcome, because there is a list of the reactions of 9,000 young people in the Public Health Department available for reference.

REVERSION IN TUBERCULIN ALLERGY

Burrell, (1929)[56] writes, "but it is an undoubted fact that some people give a strongly positive reaction although they have no apparent illness, nor do they subsequently develop any disease ..... when a tuberculosis lesion heals, the sensitiveness to tuberculin does become less as time passes and a strong reaction does suggest a recent infection or activity."

The first part of this statement is absolutely true but the second and third sentences are not absolute. Firstly, many of the adults whom I tested, and in whom the reaction was very marked to 1/10,000 O.T., still had equally strong reactions, (Heaf +++), after 15 years and so, at the end of the 15 years, it could not represent a recent infection and it certainly did not indicate activity because, in the mill where these tests were recently carried out, (October, 1964), following the notification of a case of phthisis with positive sputum in a young woman, all were x-rayed and no new cases found. The majority of the workers were still the same as were employed in 1951 and, in the case of new employees, I had their previous tuberculin reactions noted. (The case was of a woman, born 1937, who was negative on

leaving school in 1951 and who had refused B.C.G.). No new cases were found among these contacts.

In the Prophit Report, the reversion rate is shown to vary according to many different factors; being lowest in those persons most likely to have repeated contact and also in individuals reacting to high dilution. These are findings which one would expect and were observed in Lewis. I have not observed reversion in those mill workers who reacted to high dilution

The Prophit Report writers question the validity of calling a minimal reaction to 1 mg. O.T. positive, but they also cautiously indicate that such reactors may have been positive to higher dilutions earlier in their lives. I think I have indicated that this has happened in Lewis.

Hertzberg, (1948)[57] says, "Swedish, Danish and American reports indicate the existence of permanent loss of allergy after a positive tuberculin reaction following natural infection. We have seen nothing of this although, since 1939-40, we have been on the look out for it by repeating tuberculin tests on persons found to be tuberculin positive many years earlier. We have but rarely observed oscillations between positive and negative in one and the same person." And withal he describes, in Chapter of his book, how a domestic servant, aged 24, was negative to 3 mg. O.T. but x-ray revealed a calcified primary complex and, after B.C.G., she developed an abscess with ulceration within one week; two months later her Mantoux was faintly positive and, in two years, she was again negative to 1 mg. O.T. She was re-vaccinated with another abscess resulting in two weeks, but the degree of allergy was slight when tested with 1 mg. O.T. She refused further vaccination. (He does not say that he had found her originally positive, but this would most likely have been the case at some time.) I have described a somewhat similar happening in Part One of the Thesis when treating "Reversion

NON-SPECIFIC REACTIONS

Reactions to fairly strong concentrations; e.g. 1/100, are frequently referred to as non-specific. In view of the fact that reversion can occur after reaction to dilute tuberculin - 1/10,000, and even in radiologically confirmed cases, I find it difficult to accept that such reactions to 1/100 O.T. are non-specific, and the fact that violent reaction to B.C.G. vaccination of a seemingly negative reactor occasionally takes place, even where

the vaccine has been administered truly into the skin and not deeply, seems to me to confirm this opinion.

Ustvedt and Aanonsen, A., (1949)[58] describe the use of B.C.G. as a test to eliminate spurious Mantoux positive reactors. They made two punctures through a drop of B.C.G. 20 mg/ml. The reactions to this they divide into "early" and "late" B.C.G. reactors; the "early" response occurs within 2 or 3 days and those giving this reaction are termed allergic, although they failed to show any signs to 100 T.U., (induration less than 10 mm.) while the "late" response, arising 10 to 12 days later, is considered non-specific. In addition, they make the outcome of this test the basis of the claim that reversion is rare in Norway. Should a person once found positive later give a negative reaction, they consider that the original positive reaction was non-specific. This is certainly not true as regards all the reactions in Lewis.

Frappier and Roland[59] describes a B.C.G. skin test for the detection of the total tuberculosis allergy and they talk of infra-tuberculin allergy as shown by an accelerated local reaction to B.C.G. in subjects completely negative to intradermal P.P.D. 0.005 mg. This is somewhat similar to the test I described with Heaf apparatus, (PPD = B.C.G.). They recommend their test for the following definite purposes:

1. To detect in certain clinical cases tuberculosis infection in its infra-tuberculin allergic state.
2. To give to the epidemiologist, during special investigations, a more precise reference as to the diffusion of the tubercle bacillus.
3. To replace long, serial and costly tuberculin tests in view of the B.C.G. vaccination.

An interesting observation which they make is that the introduction of live B.C.G. might act as a booster dose bringing faded allergy to positivity or higher intensity and reinforcing resistance, in fact, they suggest the test might be for such individuals an efficient vaccination. This last suggested possibility I doubt, since, as I have explained, repeated vaccination - even producing post vaccination allergy - do not seem to be enduring.

TUBERCULOSIS FOLLOWING MANTOUK CONVERSION

In the Prophit Report the point is made that primary infection did not

always lead to morbidity, in fact this arose in a minority of people. Irish and Welsh nurses had higher morbidity rates following primary infection. We have seen that, among school children, primary infections led to a very considerable proportion of morbid cases; 18.8 per 1,000 entrants to the Lewis Survey in the first 15 months. In young adults, as Professor Heaf remarked, the type of disease here was acute exudative and seemed to proceed direct from primary infection. Reinfection would not seem to play a marked role in producing morbidity among the Islanders.

The leading article in Tubercle, Vol.XXXVII, June, 56, No.3, discusses a Monograph on tuberculosis in the U.S. Army during World War II. Here it is noted that the attack rate was highest for 19-22 age group, (in Britain, 15-24 male and female), and indicates that the present higher prevalence of tuberculosis among elderly males is due to the breakdown of old lesions acquired much earlier in life. When comparison was made of the pre-service x-ray with that after discharge of 3,000 notified cases of tuberculosis and 3,000 not notified, it was found that 50% almost should not have been accepted This confirms my observations among the pre-service boys, those discharged early in their war service due to tuberculosis, Forces personnel and the post-war Grade IV boys. Macgregor in "The Two-Year Mass Radiography Campaign in Scotland" 1957-58, regrets the absence of a second opinion on the films taken during the campaign and quotes various authorities to show that dual photofluorographic interpretation would have produced 12 to 20 per cent. more clinically significant cases. This gives some indication of how many must have been missed when they were only clinically examined.

The fact that the vast majority of those cases of pre-service boys and Grade IV service call-ups suffered no illness gives point to the statement of the early writers that the Islesmen seemed to have immunity as long as they remained at home. I interpret this "immunity" to the absence of psychological disturbance which the Islanders underwent on leaving home.

POSITIVE REACTOR RATE IN RELATION TO SEX AND AGE

We saw from the Table of Tested and Vaccinated, (1950), that sex and age are factors in the reactor rate. Among school children girls tend to have a higher rate than boys and, as the children get older, the rate for

both sexes increases. A perfectly natural phenomenon since growing up is accompanied by ever-widening circle of contacts, thus:

Age Group	Positive Percentages M	F
1 - 5	15	10
5 - 10	24	24
10 - 15	35	38
15 - 20	46	51
Employed adults	90	76

It will be noticed how, in adults, the male positive reactor rate greatly exceeds the female rate.

D'Arcy Hart, in 1929, carried out a tuberculin sensitivity survey and he reported:

Age Group	Positive to Mantoux 1/1,000 or higher
0 - 2	6.5 per cent.
3 - 5	18 "
6 - 10	38 "
11 - 20	70 "
21+	90 "

In the Prophit Report, (1948) (Daniels et. al.), the result of the survey is given separately for the sexes and for each age group; males have a higher incidence of allergic reaction.

Age Group	Positive to Mantoux 1/1,000 or higher M	F
0 - 17	75	76.7
18 - 19	82.9	79.5
20 - 21	87.9	83.2
22 - 23	88.3	88.9
24 +	89.4	89.2

The M.R.C. National Survey, 1949-50, likewise shows males to have a slightly enhanced rate as compared with females.

Age Group	Positive Percentages M	F
5 - 6	14.9	15.5
7 - 8	21.7	20.8
9 - 10	28.8	30.1
11 - 12	27.5	35.4
13 - 14	43.1	41.8
15 - 16	53.1	49.7
17 - 18	65.2	56.2
19 -20	69.8	64.5

Tuberculosis (all forms) in the Lews

Notifications (N) and Deaths (D) in age groups for the years 1945 - 1957

Age Groups		- 4	5-	10-	15-	25-	35-	45-	55-	65+	Total all ages
1945	N	-	1	3	34	29	15	4	2	-	88
	D	-	-	-	10	9	5	2	3	2	31
1946	N	1	1	2	34	16	9	5	1	1	70
	D	-	-	-	5	8	5	1	3	-	22
1947	N	3	1	4	20	10	5	3	1	-	47
	D	1	-	-	6	8	9	2	3	1	30
1948	N	4	1	5	24	19	8	4	-	1	66
	D	2	-	-	7	16	8	2	1	2	38
1949	N	-	1	2	18	12	4	2	-	1	40
	D	1	-	-	6	6	2	9	1	3	28
1950	N	3	2	6	36	15	15	6	1	-	84
	D	-	-	-	4	2	6	4	1	1	17
1951	N	2	1	4	36	12	7	5	5	1	73
	D	1	-	-	-	3	2	3	2	3	14
1952	N	4	2	-	24	12	10	5	2	1	60
	D	-	-	-	1	2	1	-	-	-	4
1953	N	3	1	3	14	15	5	4	2	2	49
	D	-	-	-	-	4	4	2	4	3	17
1954	N	-	1	2	13	6	2	4	1	1	30
	D	-	-	-	-	-	-	1	-	1	2
1955	N	-	-	1	13	5	5	3	3	2	32
	D	-	-	-	-	1	1	-	2	2	6
1956	N	-	1	-	11	3	7	2	3	-	27
	D	-	-	-	-	-	1	1	1	1	4
1957	N	-	-	-	8	6	9	1	1	1	26
	D	-	-	-	-	1	2	-	4	1	8
Total all years	N	20	13	32	285	160	101	48	22	11	692
	D	5	-	-	39	49	46	27	25	20	221

Population (Lewis) 1951 Census

Total population	23,731
Population -4 years	2,105
Population 5 - 14 years	3,698
Population on School Roll	3,957
Population over 14 years	17,928

When giving results from other countries the Report draws attention to variations in differing districts in the same land. This is very noticeable in Lewis itself, small as it is. And, of course, the reactor rate is changing year by year quite independently of the diminishing opportunities for infection because, as we have seen, reversion is a relatively occurrence, at least among school children. It does not appear to happen so frequently among adults.

Attention is drawn to this phenomenon in the Prophit Report and also to the fact that the change can considerably alter the tuberculin sensitivity in any locality.

The table, opposite was prepared for Dr. MacGregor, Department of Health, when the question of grant for clerical work in connection with the Lewis Survey was under review.

Study of this table shows that for children between 5 and 14 years, there were four notifications annually for the periods 1945 - 1949 and 1950 - 1954, with one only each year during 1955 - 1957. No deaths occurred in this age group during any of these time intervals. For those 15 to 24 years the corresponding figures were, 26 notifications per annum with 7 deaths; 24 notifications with one death, and 11 notifications annually with no deaths. For those aged 25 to 34 the figures were, 17 notifications with 9 deaths; 12 notifications with 2 deaths, and 3 notifications with less than 1 death - all per annum.

My interpretation of these figures is to the effect that although infection early in life, as revealed by the tuberculin tests, did not lead to a correspondingly high rate of illness, nevertheless, those so infected went on to morbid conditions in their early manhood and womanhood. That all those suffering were not notified is brought out in the Survey, and the drive to have the children tested and x-rayed reveals this. We need only compare the numbers statutorily notified with the numbers uncovered by the Survey. Hence it would seem to me that early B.C.G. vaccination was the correct procedure in view of the widespread dissemination of tubercular infection among children. The advent of anti-biotic treatment, while most valuable and wonderful, rather obscures the value of protective vaccination.

RESULTS OF THE LEWIS SURVEY IN RESPECT OF SCHOOL CHILDREN

Lewis Survey Table I shows in the last column that 74 boys and 48 girls developed tuberculosis between October, 1949 and December, 1958. During the 15 months, October, 1949 to December, 1950, 45 boys and 33 girls were reported. The reporting of cases was carried out by the Chest Physician after clinical and radiological examination of children referred to him by their family doctors on account of illness, or because the child had shown a positive reaction to the tuberculin test. An analysis of each group, classified according to the terms set forth in the protocol, is now made.

4 (b). Initially tuberculin negative and not vaccinated

The totals reported in this section were Boys, 12, Girls, 8, so that of the 74 boys and 48 girls reported, 16 per cent. boys and 16 per cent. girls were infected during the period of the survey.

4 (a). Initially tuberculin positive

The totals reported in this section were: 62 Boys and 40 Girls, so that, of the 74 boys and 48 girls reported, 80 per cent. of each sex developing tuberculosis were already infected on entry to the Survey. Those giving a positive reaction are further analysed according to the degree of allergy.

4(a)(i). Mildly reacting, +: Twenty-nine boys and 23 girls fell into this category or, expressed as a percentage of the total reported, we get 40 per cent. for boys and 48 per cent. for girls.

4(a)(ii). Moderately reacting, ++: Twenty boys and 14 girls or, in percentages of the total reported cases, 17 per cent. for boys and 6 per cent for girls.

4(a)(iii) Strongly reacting, +++: Thirteen boys and 3 girls or, in percentages of the total reported cases, 27 per cent. for boys and 30 per cent. for girls.

At first glance it would appear as though those mildly tuberculin sensitive were those most liable to contract the disease but, on analysis of the figures, it is seen that this is not the case. As mentioned, the Disease Groups 1, 2, 3 and 4 are of such a degree of severity as to be notifiable and fall for active treatment, whereas Disease Group 5 does not demand statutory notification; for the majority of them periodic supervision might suffice.

In the case of those initially negative, it will be seen that 11 of

the 12 boys and 7 of the 8 girls acutely ill, were notified and had treatment. The other one boy and one girl, as recent converters, also had treatment. Of the 52 (boys and girls), reacting mildly (+), 9 or 17 per cent. were notifiable. Of the 34 (boys and girls), reacting moderately (++), 10 or 29 per cent. were notifiable, and of the 16 (boys and girls), reacting strongly (+++), 6 or 37 per cent. were notifiable.

4 (c) Tuberculin negative, receiving B.C.G. vaccination

This group comprised those primarily vaccinated; i.e. so treated within six months of entering the scheme; their number was 5,247. Of the 5,247 only one person developed tuberculosis. This was a girl who went to Glasgow for training as a nurse. She had B.C.G. just prior to setting off from Stornoway, and I was unable to find out if her vaccination had been successful. She was a contact, her mother was notified shortly before the girl left home to undergo training.

LEWIS SURVEY - TABLE 2

This Table 2, like Table 1, sets forth those school children in school at the commencement of the Survey in 1949 - 1950 who were discovered to be suffering from tuberculosis; they are arranged according to their year of birth.

The persons concerned in Table 2, were of school age and were classified A, B and C, and coded as indicated. Class A comprises those pupils dealt with in Table 1.

The first column gives the year of birth and the horizontal years are the years of reporting cases of tuberculosis developing in each of the classes. For example, for persons born in 1932, in class C, we see that in the vertical column for 1938, one male and two females were reported that year.

The totals for 1949-50, for pupils born between 1931 and 1945 are as follows:

Class A	45 boys	33 girls
B	4 "	3 "
C	7 "	11 "
	56 boys	47 girls

At the close of the Survey, in 1958, it will be seen, that these Classes A, B and C have been augmented by the discovery of new cases arising among their number so that they now read - Total (vertical column.)

Class A	74 boys	48 girls
B	4 "	3 "
C	47 "	51 "
	125 boys	102 girls

Class B (status code 2 + another code number) consists of pupils coming from schools other than in Lewis, e.g. from Glasgow.

Class C comprises persons born between 1931 and 1945, 47 boys and 51 girls. Boys and girls, born after 1935, ought to have been status code 2, but, through clerical errors, the ringing (0) of the two was overlooked on their cards. Those born before 1935, i.e. 1934 to 1931, were boys and girls working in shops, offices or the mills. However, 10 boys and 6 girls (born between 1935 and 1939), should have been included in Class A. The final total in Class C therefore reads: 47 - 10 = 37 boys, 51 - 6 = 45 girls and the 37 boys and 45 girls represent young people in employment.

Attention is drawn to the fact that every one reported in Class C was sufficiently ill to require notification, since all fell within disease group 1, 2, 3 or 4. Of the 125 boys and 102 girls reported, 74 boys and 70 girls were cases of active disease, and 40 boys and 32 girls yielded a positive sputum. There were 8 boys with non-respiratory disease, 2 of whom developed meningitis and 11 girls with non-respiratory disease, one of whom had meningitis.

INCIDENCE OF TUBERCULOSIS

As the number of children, status Code 2 and Code 2 + 1, i.e. actually attending school and entering the Survey during 1949-50, numbered 4,128, and of these 78, Class A (45b + 33g), (Table 2, Lewis Survey), were reported during 1949-50, we have a rate of 18.8 per 1,000 participants for this period and, with 11 notifications, a notification rate 2.7 per 1,000 pupils, all from those tuberculin positive.

Over the 10 years the number reported rose to 122 Class A, (748, 486) giving an annual rate of 2.95 per 1,000 school children. During these 10 years, 43 were notified yielding a notification rate of 1.05 per 1,000 pupils.

and this notification rate is composed of 58 per cent. positive reactors and 42 per cent. negative reactors.

The grand total of 228 cases, (Table 2, Lewis Survey), reported between 1949 and 1958, is from the 6,822 participants, born after 1931 and thus under 27 years of age in 1958. The reported cases comprised 148 notifications and 80 who showed definite radiological evidence in addition to being tuberculin sensitive, and of the 148 severely affected, 20 were from the tuberculin negative un-vaccinated group and one from the B.C.G. vaccinated group.

Among pupils under 15 years of age, of 43 boys, 13 were active and, of 44 girls, 13 were also active. While 31 boys and 28 girls under 12 years old suffered from definite tuberculous disease. Against this is placed one case of tuberculosis arising among 5,247 people B.C.G. vaccinated. Pollock, (1964) writes, "The tuberculosis vaccine B.C.G. may be safely given in infancy, or indeed at any age. However, tuberculosis is relatively infrequent in childhood and it is therefore recommended that the vaccine should usually be given to children aged 10 to 12 years. At this age, B.C.G. can be expected to provide protection during the critical years of adolescence and early adult life."

The figures given above bring out very plainly:

1. The seriousness of the conditions which existed in Lewis.
2. The extent of effort put forward to deal with the situation.
3. The need for mass B.C.G. vaccination in Lewis.
4. The very great protective value of B.C.G. vaccination under the contemporaneous conditions in Lewis.

And it would seem that the official scheme of offering B.C.G. to children on reaching 12 or 13 years of age is rather late, at least for Lewis.

SUMMARY

It was well authenticated by compemporary medical and other writers that Lewis was very free from tuberculosis a century ago. The main reason for this was isolation of the area from the Mainland and the distances between the villages on the Island also the difficulties of travel hindered the spread.

The bacillus was imported;(an instance of the likely source of introduction to one Parish is given,)as often as not by returning natives who had contracted the disease in the cities.

From the description of the socio-economic conditions as given in the writings of the time, and by several Commissions, also from personal experience, it seems clear that all the factors favouring a violent explosion were extant in Lewis. The first important factor was a non-tuberculinised population, housed under the most appalling conditions in "Black Houses." These consisted of one or two apartments, unventilated and almost devoid of daylight, in which there might be between six and a dozen inmates. Hygiene and sanitation were foreign to the populace. Add to this the total ignorance of the people as to the infectious and contagious nature of the disease, and the scene is set for a volcanic eruption.

Facts and figures from various Departmental Reports, Government Commissions, Registrar-General's Statistical Data, augmented by personal research of the Death Registers since 1855, are set forth to show how Lewis, within less than 50 years, passed from being a tubercle free area to become a most devastated zone. The tubercle bacillus, despite all those most advantageous circumstances, did not lead to peak death rates as high in Lewis as it did in other regions in Britain.

A century ago the Lewisman was considered to be immune to tuberculosis; in the early years of this century he was classed as tuberculous prone. In this thesis I believe it has been demonstrated that he was resistant, if not to infection, at least to morbidity and death, this is indicated by the high reversion rate among positive reactors in whom x-ray revealed evidence of disease. The above-average constitution of the Islanders and the general body-building diet which they enjoyed, enhanced this resistance.

As has been stated above, the data showed how the explosive wave of morbidity and mortality advanced, but it also shows how the decline followed quite spontaneously, despite the absence of medical help and so proves that tuberculosis is a self-limiting disease. The explanation of why the infection was self-limiting would appear to be due to the increased resistance derived from the almost universal acquisitinn of tuberculin allergy and figures are given to support this view.

In support of this opinion, information of the value of B.C.G. vaccination in restoring the universal tuberculin allergy with its beneficia effects, are set forth: the protective power conferred by B.C.G. vaccine is made plain, when it is realised that only one case of tuberculosis had occurred among over 6,000 vaccinated.

I believe that the increase in morbidity and mortality during the War years was brought about by the psychological upset resulting from hostilities. Those left at home were equally involved in this unnatural mental and spiritual disturbance and so the rates among civilians rose also.

I feel that had there been no War 11 Lewis would have been as free from tuberculosis by the natural process of regression as it was in 1960 after mans interference. Indeed Littlejohn's words "there is no disease which is apparently so curable as phthisis" were true for Lewis.

References.

PART I

1. Page 6. Beddoes John (1855) - "Races of Britain - A Contribution to the Authropology of Western Europe." 1855 p. 240.
2. Page 7. MeNeill Commission 1851.
3. Page 7. Napier Commission 1883.
4. Page 16. McCulloch John (1891) "A Description of the Western Islands of Scotland" 1891.
5. Page 20. Darling Fraser F. (1955) "West Highland Survey" 1955 p. 142.
6. Page 21. Bain, Poor Law Magazine 1883. "Destitution in the Western Highlands and Islands" p. 284.
7. Page 21. Report on the condition of the Cottar population in the Lews 188
8. Page 21. Roper Dr. R.N. H.M.S. Jackal ibid. p. 41.
9. Page 24. Report of the Crofter Commission 1903.
10. Page 25. Martin Martin (1695) "A description of the Western Islands" 1695 Glasgow Uni. Reprint 1884, p. 11.
11. P.25-26. Morgan, J.E. (1860) Brit. For. Med. - Chir. Review Oct. 1860. "On the non-prevalence of pulmonary consumption in the Hebrides and along the N.W. Coast of Scotland."
12. P.26-27. Willis Thomas - quoted in the correspondence columns of B.M.J. May 1864 by Elliott, G.F.
13. Page 27. MacCormac Henry, (1868) "The Crucial Test in regard to the Origin of Phthisis and Tubercle." B.M.J. 28 Oct. 1868.
14. Page 28. Smith Robt. (1872) "Immunity of the North West of Scotland and the Hebrides from Phthisis." Ed. Med. Jr. Jan. 18, 1872 p. 606.
15. Page 28. MacDonald, K.N. (1873) "On the causes of the predisposition to phthisis among natives of the Hebrides and West Highlands." Ed. Med. Jr. 19, 1873, p. 229.
16. Page 28. MacNab John (1869) "Immunity from Consumption in the Hebrides" A Pamphlet 1869.
17. Page 28. Maclennan M., D.D., quoted by Gibson Geo. See Ref. 38.
18. Page 29. Stornoway Gazette Editor - Letter from Sir Jas. Matheson to his prospective coachman.
19. Page 29. Reg. Gen. for Scot. Ann. Report 1855. Introduction also Scrofula deaths.
20. Page 29. Smith, W. Anderson (1875). "Lewisiana" 1875.

21. Page 30. Lewis Local Committee (under Scottish Office) Report 1903.
22. Page 30. Ibid. M.O.H. Ross & Cromarty Reports 1892, 98, 1902.
23. Page 31. Medical Relief Committee (Local Gov. Board) 1904.
24. Page 31. Highlands & Islands Med. Ser. Co. Report 1912.
25. Page 38. Hutchinson Rev. Healey (1875) (sixty-one) "Twenty years sporting in Lewis" 1875 p. 225.
26. Page 40. Williams H. (1930) "Some observations on Tuberculosis in the Hebrides with special reference to Milk." Trans. of Tub. Soc. of Scot. 1929-30.
27. Page 41. Macbeth John D. (1931) Vet. Report to County M.O.H. Ross & Cromarty 1931.
28. Page 41. Munro Chris., (1950) Vet. Report to County M.O.H. Ross & Cromarty 1950.
29. Page 42. Munro Chris. (1951) Vet. Report to County M.O.H. Ross & Cromarty 1951.
30. Page 43. Report by M.O.H. for Isle of Lewis 1923.
31. Page 45. Littlejohn Henry (1888) "Tuberculosis in cattle" Poor Law Magazine, 1888 p. 297.
32. Page 49. Dragsted I., Lancet 1949. 2/3 pp. 103 - 105.
33. Page 49. Marks J. and Birn K.J., (1963) B.M.J. Dec. 14, 1963, 1503-6.
34. Page 50. Horne J. Landess, County M.O.H. Ross & Cromarty Ann. Rep. 1950.

PART II

35. Page 3. Daniels Marc. et. al. 1948 - Prophit Report "Tuberculosis in Young Adults" 1948.
36. Page 3. Palmer C.E., Shaw L.W. 1953, Amer. Rev. Tub. 68, 467.
37. Page 7. Bowen E.G. Brit. (1929) "The Incidence of Phthisis in relation to racial types and social environment in Wales." Tub. Jr. July 1929.
38. Page 7. Brownlee J. (1918) M.R.C. Spec. Rep. Parts 1 & 11, 1918.
39. Page 8. Chalmers, A.K. Public Health 1913, 27 pp 36-49. "A page in the Natural History of Tuberculosis."

40. Page 10. King J.D. 1940, M.R.C. Sp. Rep. Ser. No. 241. 1940.
41. Page 12. Paton Noel, 1922, Glas. Med. Jr. March 1922.
42. Page 12. Gibson Geo., 1924, "The Black House of the Outer Isles" Caled. Med. Jr. Aug. 1924.
43. Page 13. Irvine, K. Neville, 1954. "B.C.G. & Vole Vaccinations" 1954 p. 37-38.
44. Page 14. McKinlay P.L., (1935), "Decline of Tuberculosis Death Rate" Reg. Gen. Report 1935.
45. Page 16. Macintosh J. Stewart, 1912, B.M.J. 1912 ii p. 370.
46. Page 16. Fraser D. 1900, N.A.P.T. Tuber. Jr. Vol. I. 1900.
47. Page 17. Lindsay, 1913, "Irelands Crusade Against Tuberculosis" quoted in Proc. Reg. Soc. Med. 1913, Part 2 Epidemic Sect. 1-48, 1913
48. Page 17. Blacklock J.W.S. (1935) Br. Jr. Tuber. Vol. XXIX No. 2 pp. 69-85, 1935.
49. Page 22. B.M.J. 1957 Leading Article 16, March, 1957.
50. Page 24. Bradbury, F.C.S. (1933) "Causal Factors in Tuberculosis" N.A.P.T. 1933.
51. Page 25. Hart, P. D'Arcy, & Payling Wright, C. (1938) "Tuberculosis and Social Conditions in England", N.A.P.T. 1938.
51. Page 26. Putnam P. (1927) quoted by Hart.
51. Page 26. Dahl, R.H. (1933) " " "
52. Page 26. Schloismar, 1864, B.M.J. - correspondence columns.
53. Page 26. Sigurdsson, S. 1945. "Tub. in Iceland" - A Monograph. Dungal quoted by Sigurdsson.
54. Page 28. MacGregor Ian M. (1960) Brit. Vet. Jr. CXVI, 10 pp. 395 - 402.
" " " (1961) "The Two Years Mass Radiography Campaign in Scotland, 1957-58.
55. Page 30. M.R.C. 3rd Report (1963) "B.C.G. & Vole Vaccine Trials", B.M.J. April, 1963, p. 973.
56. Page 30. Griffith, A.H. (1963), B.M.J. Sept. 21, 1963. p.717.
57. Page 30. Burrell, L.S.T. (1929), Recent Advances in Pulmonary Tuberculo
58. Page 31. Hertzberg, Gerhard, (1948) "The Achievements of B.C.G. Vaccination."
59. Page 32. Ustvedt, H.J. & Annonsen, A. 1949. "Diagnostic B.C.G. Test."
60. Page 32. Frappier, A. and Roland, G. Canadian P.H. Jr. Vol. 41 No. 2
61. Page 33. Tubercle (1956) Leading Article Vol. XXXVII No. 3

62. Page 19. Mitchison, D.A., et. al. 1961. Tubercle 42, 317.

63. Page 19. " " " 1963, Jr. Path. & Bact. 86, 377.

64. Page 39. Pollock, T.M. (1964) Chest & Heart Ass. Health Jr. Tub. 1964 p. 12.

65. Page 33A. Murray D. M.O.H. Report 1911.

TABLE 1

	Deaths from T.B. (all forms) Percentage of deaths from all causes.	Death Rate per 100,000 Tuberculosis			ALL CAUSES OTHER THAN TUBERCULOSIS	Death rate percent of corresponding rate for 1855-64			
		ALL FORMS	PULMONARY	OTHER FORMS		TUBERCULOSIS ALL FORMS	TUBERCULOSIS PULMONARY	TUBERCULOSIS OTHER FORMS	ALL CAUSES OTHER THAN TUBERCULOSIS
1855-64	8.9	139	131	7.6	1421	100	100	100	100
1865-74	8.2	124	117	6.9	1369	89	90	90	96
1875-84	9.5	157	147	9.6	1474	113	110	125	103
1885-94	12.1	187	165	22.0	1346	134	126	289	94
1895-04	14.4	232	204	28.4	1350	161	155	373	94
1905-14	13.1	227	198	29.0	1217	163	151	381	85
1915-24	13.8	196	171	25.0	1211	141	130	329	85
1925-34	11.8	161	141	20.0	1184	115	108	263	83
1935-44	7.6	107	94	13.0	1343	79	71	171	94
1945-54	6.1	89	79	10.0	1330	64	60	131	93
1955-59	1.3	19	15	4	1314	13	10	52	92
						Death rate percent of corresponding rate from 1895-04.			
1895-04						100	100	100	100
1905-14						91	97	102	90
1915-24						84	83	88	98
1925-34						68	69	70	87
1935-44						46	46	45	99
1945-54						38	38	35	98
1955-59						8	7	14	97

The first thing noted from Table 1 is that tuberculosis as a cause of death was common when the Registration Act became law. However, the figures are most assuredly exaggerated and, as explained, the reason is that 'Consumption' to Gaelic Registrars meant any wasting illness so in the absence of medical certification - rare at this period - the registrar interpreted the information given about gradual decline and wasting as 'consumption.

From column 1 we see how its importance as a killing disease rose till in 1895-1904 it was responsible for 14.4 per cent of all deaths. The next decennium 1905-14 saw a fall to be succeeded by a rise consequent on conditions caused by the World War 1. There-after the decline continued, somewhat retarded by World War 11.

In the last quinquennium 1955-59 the rate stood at 1.3 per cent and was still an important cause of death. For the respiratory form, for these five years, the rate of 1 compares favourably with the initial percentage of 8.7 but even more with the peak of 13.6 in 1895 - 1904.

The rate for all other causes of death have but little altered in the century.

A notable feature is the low figure for "other forms of tuberculosis" death rate in relation to the respiratory death rate but this relation changes with the passage of the years thus:

1855-64	Respiratory	Other Forms	1955-59	Respiratory	Other Forms
	= 94.6%	= 5.4%		= 75.5%	= 24.5%

This is the reverse of Scotland as a whole experience thus:

1871-75 Pulmonary = 69% 1930-39 Pulmonary = 74% 1955-59 Pulmonary = 88%

The columns showing the percentage rate for each period relative to the first (1855-64) makes it clear how non-pulmonary tuberculosis has assumed a graver form. The pulmonary rate has dropped by 90% but the non-pulmonary by only 50% of their first values. However, if the quinquennial figures (1955-59) are compared with those for 1895-1904 we see a mighty change both in respiratory and non-respiratory rates. Table 1A shows the same characteristics.

Table 1A Tuberculosis deaths expressed as a percentage of Deaths from all causes in Lewis 1950-54 and 1955-59.

Similar data for "Scotland as a whole" are added for comparison.

TABLE 14

LEWIS

Period	Deaths from all causes		Deaths from Tuberculosis				Tuberculosis deaths as a % of all deaths.			
			Respiratory		Other forms		Respiratory		Other forms	
	M	F	M	F	M	F	M	F	M	F
1950/54	808	984	36	13	4	9	4.4	1.3	0.49	0.91
1955/59	829	850	12	5	3	2	1.44	0.58	0.36	0.23

SCOTLAND

Period	Deaths from all causes		Deaths from Tuberculosis				Tuberculosis deaths as a % of all deaths.			
			Respiratory		Other forms		Respiratory		Other forms	
	M	F	M	F	M	F	M	F	M	F
1950/54	158427	153015	4600	3303	565	567	2.88	2.13	0.35	0.28
1955/59	158821	150885	2260	1130	206	173	1.42	0.14	0.14	0.11

Respiratory and Other forms of Tuberculosis Deaths as a percentage of Total Tuberculosis Deaths in Lewis.

Similar data for Scotland are given for comparison.

Period		Total T.B. Deaths P. & N.P.		Pulmonary as % of Total		Non-Pulmonary as % of Total	
		Lewis	Scot.	Lewis	Scot.	Lewis	Scot.
1950/54	M	40	5165	90	89	10	10
"	F	22	3870	59	85	41	15
1955/59	M	15	2466	80	91	20	9
"	F	7	1303	71	86	29	14

The tables make clear the higher mortality rates among males from the respiratory form of the disease as compared with females; this excess of males over females is in line with Scotland as a whole rate but in Lewis the difference between the rates for the sexes is greater. Scotland in the five years 1955-59 had 91% male and 85% female. Lewis had 80% and 71% for the ratios of pulmonary to total tuberculosis deaths. Taking the sexes together we get Scotland with 88.5 and Lewis with 75.5 per cent for the pulmonary form.

This combined sex figure for respiratory form makes the Lewis non-respiratory form stand out. Scotland's non-respiratory rate was 11.5% and Lewis's 24.4% of all deaths for tuberculosis. The female sex in the region as in the nation contribute most to the non-respiratory death rate.

The remarkable improvement in Lewis is obvious when comparison is made with MacKinley's table in the Registrar Generals Special Report in 1935.

	Death rate per 100,000 Tuberculosis			Deaths from Tuberculosis as a percentage of deaths from all causes
Period	All Forms	Pul-monary	Other Forms	
1931-33	84	61	23	6.3

It was 1945 before the tuberculosis death rate in Lewis had reached such a low percentage relative to all deaths.

TABLE 11 Death Rates for T.B. per 100,000 by sex and age, 1855-64 to 1955-59.

M A L E S

Period	Both sexes All Ages	All Ages	0-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+
1855-64	131.4	128.4	106.7	30.7	35.7	115.4	218.2	97.2	96.3	310.2	341.6
1865-74	117.1	133.4	68.4	24.9	14.1	228.1	232.6	146.2	152.9	145.9	273.3
1875-84	147.2	174.8	46.3	-	6.4	203.5	502.5	208.7	242.5	284.2	239.5
1885-94	164.8	193.7	21.6	11.4	11.8	352.0	535.2	297.8	185.0	158.9	163.7
1895-04	100 / 203.9	100 / 255.1	100 / 50.4	100 / 22.5	100 / 39.5	100 / 306.3	100 / 484.8	100 / 326.7	100 / 261.7	100 / 172.2	100 / 102.6
1905-14	198.1	255.6	36.3	11.3	45.2	491.6	724.3	357.4	249.4	191.3	137.9
1915-24	171.4	200.3	8.3	15.0	62.3	326.2	454.2	259.3	256.8	189.0	85.2
1925-34	140.9	158.4	9.9	7.9	26.7	256.5	475.8	230.4	123.2	104.1	94.3
1935-44	93.9	113.9	-	-	-	151.5	267.6	235.0	111.1	114.9	71.5
1945-54	79.0	111.4	9.2	-	10.5	155.2	256.4	183.3	122.0	90.0	84.6
1955-59	29.4	21.9	-	-	-	-	32.0	61.0	14.4	5.4	14.2
1955-59 Percentage of 1855-64	22.6	17.0	-	-	-	-	14.6	61.0	14.0	1.7	4.1
1955-59 Percentage of 1895-04	14.4	0.82	-	-	-	-	4.0	18.0	7.1	3.1	13.0

PULMONARY

NON-PULMONARY

MALES

Period	Both Sexes All Ages	All Ages	0-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+
1855-64	7.6	9.0	13.3	7.7	-	11.0	30.1	-	-	-	-
1865-74	6.9	7.2	-	-	7.1	5.3	15.0	-	43.4	-	-
1875-84	9.6	6.6	23.1	6.5	6.4	4.6	-	8.7	-	-	-
1885-94	22.0	28.6	59.3	22.7	23.7	29.8	36.1	16.5	19.5	11.4	11.7
1895-04	28.4	39.9	128.9	28.2	39.5	43.1	30.7	19.9	8.8	11.5	-
1905-14	100 29.0	100 30.6	100 90.8	100 45.4	100 28.3	100 17.2	1001 42.2	100 6.9	100 7.6	100 21.2	100 -
1915-24	25.0	27.2	83.1	22.6	24.9	31.1	28.0	22.2	22.0	8.2	-
1925-34	20.0	23.3	78.8	7.9	8.9	56.0	16.4	8.5	8.8	8.7	-
1935-44	13.0	19.4	18.9	-	9.6	52.4	40.5	14.2	15.9	-	7.2
1945-54	9.6	9.1	18.4	-	10.5	23.2	24.0	6.1	-	-	-
1955-59	4.3	5.4	-	-	-	-	-	1.2	-	1.8	14.2
1955-59 Percentage of 1855-64	56.0	60.0	-	-	-	-	-	-	-	-	-
1955-59 Percentage of 1895-04	14.0	17.0	-	-	-	-	-	17.0	-	8.5	-

PULMONARY

FEMALES

Period	Both sexes All Ages	All Ages	0-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+
1855-64	-	134.4	104.9	45.1	72.0	89.8	116.4	104.0	182.9	422.7	324.7
1865-74	-	100.7	63.8	14.3	48.6	80.9	157.8	93.2	131.0	156.5	282.0
1875-84	-	119.5	25.1	13.6	51.9	160.7	247.7	155.0	123.0	114.9	143.5
1885-94	-	136.0	17.3	6.1	27.5	202.9	274.3	206.4	153.7	99.3	144.8
1895-04	-	100 142.8	100 16.6	100 18.1	100 56.9	100 253.7	100 269.5	100 153.2	100 158.9	100 199.8	100 56.4
1905-14	-	140.5	12.5	17.5	115.2	234.0	246.7	217.1	169.2	90.6	40.5
1915-24	-	142.6	-	23.5	63.9	237.5	364.0	155.1	100.8	105.1	49.9
1925-34	-	123.5	21.8	16.2	17.7	322.2	284.1	113.0	51.4	89.6	43.7
1935-44	-	74.0	-	-	9.5	163.2	247.9	100.0	30.0	47.6	49.2
1945-54	-	47.2	-	-	-	125.6	137.0	75.7	17.0	40.3	9.4
1955-59	-	7.9	-	-	-	-	14.4	11.6	11.2	26.8	9.4
1955-59 Percentage of 1855-64	-	5.8	-	-	-	-	12.0	11.0	6.1	6.2	2.7
1955-59 Percentage of 1895-04	-	5.8	-	-	-	-	5.0	7.5	7.0	1.3	1.6

NON-PULMONARY

FEMALES

Period	All Ages	0-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+
1855-64	6.3	6.6	7.5	-	14.9	-	8.7	-	12.2	-
1865-74	6.5	12.8	7.2	-	9.0	11.7	7.2	-	-	-
1875-84	12.6	18.8	13.6	19.4	22.4	11.0	7.4	-	-	-
1885-94	15.7	34.7	18.1	20.7	21.7	4.6	-	16.2	18.0	-
1895-04	100 16.9	100 66.6	100 24.2	100 6.3	100 14.9	100 13.7	100 5.5	100 -	100 -	100 8.1
1905-14	27.1	81.0	23.4	23.0	37.3	23.7	5.4	31.3	-	4.1
1915-24	22.5	83.3	62.8	25.6	22.2	15.2	5.6	-	15.0	-
1925-34	17.0	32.6	24.2	17.7	25.6	22.7	17.8	12.8	6.9	-
1935-44	6.8	10.3	-	9.5	18.1	63.0	5.8	6.0	-	5.0
1945-54	10.2	29.7	-	-	29.6	-	5.8	11.3	13.3	18.8
1955-59	3.2	-	-	-	-	-	-	-	13.4	-
1955-59 Percentage of 1855-64	3.2	-	-	-	-	-	-	-	11.0	-
1955-59 Percentage of 1895-04	18.0	-	-	-	-	-	-	-	-	-

Table 11 Death rate from Tuberculosis per 100,000 by sex and age.

From this table we see that in both sexes the pulmonary death rates are heavy at ages 0-4 and after a fall at 5 years of age rise steadily in each age group to their peak in the 25-34 age range, after which there is a decline in the successive age groups but it never returns to the level of childhood. Only in the decennium 1925-34 did the 25-34 age group lose its pre-eminence and that was in the case of females only. The tendency was for females age 5-15 to exceed males from 1855 till the period 1925-34. At all ages greater than 15 years male deaths predominate and in no uncertain fashion and this is especially so from 1895 till 1914 where young men between 25 and 34 were being swept away at three times the rate for young women. It is well to look again at the graphs by Brownlee of Shetland and North Wales and we see at once how much Lewis suffered from the "young adult" type in males Lewis 7859, Shetland 6800 and North Wales 6800 per million.

For the non-respiratory type of disease the deaths occurred chiefly among the younger age groups more so with girls.

A notable feature is seen in this Table - namely the comparatively high rate for respiratory tuberculosis among infants (male and female) from birth to 4 years for the early decennia and then how the non-respiratory form supersedes the respiratory and maintains a significant rate right down to date.

TABLE 111

Percentage of Male to Female Deaths in each age group 1855-64 to 1955-59

Period	All Ages	0-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+
PULMONARY										
1855-64	95	101	65	49	128	189	85	51	73	-
1865-74	132	107	173	73	281	149	157	124	94	-
1875-84	147	184	-	12	126	202	134	197	247	-
1885-94	142	124	187	40	173	195	144	119	160	-
1895-04	187	305	124	69	215	292	211	127	86	181
1905-14	181	290	64	39	209	293	164	147	189	340
1915-24	140	-	64	97	137	124	169	115	180	172
1925-34	128	45	48	150	79	167	203	239	116	215
1935-44	154	-	-	-	92	170	235	370	241	148
1945-54	234	-	-	-	123	187	242	710	227	900
1955-59	360	-	-	-	-	222	525	128	20	151
NON - PULMONARY										
1855-64	142	200	102	-	73	-	-	-	-	-
1865-74	110	-	-	-	59	128	-	-	-	-
1875-84	52	128	72	-	90	117	72	-	-	-
1885-94	182	171	28	114	137	789	-	120	70	-
1895-04	236	192	116	627	289	216	361	-	-	-
1905-14	113	112	194	123	46	179	127	24	-	-
1915-24	120	99	36	97	140	184	398	-	54	-
1925-34	124	240	32	50	214	72	47	69	126	-
1935-44	285	183	-	100	290	64	234	265	-	-
1945-54	89	62	-	-	78	-	105	-	-	-
1955-59	137	-	-	-	-	-	-	-	13	-

TABLE 111. In the pulmonary section of this table it is noted that the percentage of male to female is always more than 100 and that in recent times this male preponderance is very great. The same is seen in the 0-4 age group and in the 5-9 age group until after 1895-1904. Girls age 10-14 on the contrary, suffered much in excess of boys of these ages until 1925-34 when the positions were reversed. It was at this time that young women of 15-24 took over the lead for 20 years from 1925 to 1944. For all higher age groups the males were in excess of female and this is specially noticeable for men of 25-34 years and this is most noticeable around the years 1895-1914. We observe how the older men in recent time have deteriorated in that their mortality rates are greatly in excess of those for elderly women.

For the non-respiratory form of the disease no definite pattern can be made out other than that males again suffer most.

TABLE IV

Death rates in each age group in each decennium from 1865 expressed as a percentage of the corresponding age group death rate in 1855 - 64.

MALE PULMONARY
FEMALE PULMONARY

Period		All Ages	0-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+
		100	100	100	100	100	100	100	100	100	100
1855-64	M	128.4	106.7	30.7	35.7	115.4	218.2	97.2	96.3	310.2	341.6
	F	134.4	104.9	45.4	72.0	89.8	116.4	114.0	189.2	422.7	338.2
1865-74	M	105	64	81	40	195	106	150	169	47	80
	F	74	60	31	67	90	135	82	69	37	84
1875-84	M	136	43	-	18	176	230	215	250	91	70
	F	88	24	30	72	170	212	136	65	27	42
1885-94	M	150	20	37	33	305	245	306	192	51	47
	F	101	16	13	37	224	235	181	81	23	47
1895-04	M	207	49	73	110	473	361	344	206	55	30
	F	105	16	40	69	282	230	134	84	47	17
1905-14	M	200	32	37	126	426	313	367	256	61	40
	F	104	12	38	162	261	212	191	84	22	12
1915-24	M	157	8	49	173	283	208	266	263	60	25
	F	105	-	52	89	264	312	136	53	25	15
1925-34	M	123	9	25	74	252	218	237	126	33	27
	F	91	20	35	24	358	237	99	27	21	13
1935-44	M	89	-	-	-	131	138	241	114	37	20
	F	55	-	-	13	181	213	88	16	11	1
1945-54	M	86	8.5	-	2.9	134	117	189	127	29	25
	F	38	-	-	-	139	117	65	9	10	3.0
1955-59	M	17	-	-	-	-	14.6	6.1	14	1.7	4.1
	F	5.6	-	-	-	-	12	11	6.1	6.2	2.7

TABLE IV N.P.

MALE NON PULMONARY
FEMALE NON PULMONARY

Period		All Ages	0-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+
		100	100	100	100	100	100	100	100	100	100
1855 rate-	M	90	133	77	-	110	301	-	-	-	-
1864 rate	F	63	66	75	-	149	-	87	-	122	-
	M	80	-	-	-	48	50	-	-	-	-
1865-74	F	103	194	96	-	60	-	84	-	-	-
	M	73	173	84	-	41	-	-	-	-	-
1875-84	F	200	284	169	-	150	-	87	-	-	-
	M	317	446	307	-	270	120	-	-	-	-
1885-94	F	250	526	1081	-	146	-	-	-	147	-
	M	443	969	379	-	391	100	-	-	-	-
1895-04	F	268	1009	327	-	100	-	64	-	-	81
	M	340	682	589	-	156	107	-	-	-	-
1905-14	F	430	1286	312	-	250	-	62	-	-	67
	M	302	624	390	-	280	93	-	-	-	-
1915-24	F	357	1262	837	-	149	-	64	-	123	-
	M	251	585	102	-	509	54	-	-	-	-
1925-34	F	270	459	322	-	171	-	204	-	56	-
	M	215	141	-	-	467	133	-	-	-	-
1935-44	F	100	156	-	-	122	-	66	-	-	-
	M	100	136	-	-	211	105	-	-	-	-
1945-54	F	162	434	-	-	194	-	66	-	11	-
	M	60	-	-	-	-	-	-	-	-	-
1955-59	F	50	-	-	-	-	-	-	-	58	-

Table IV shows the death rate in the two sexes expressed as a percentage of the first decennial rate and also the rates subsequent to 1895-1904 as a percentage of the rates for that period. Taking the male pulmonary rates we notice how it is the under 15's who have shown most improvement; indeed since 1935 no boys of this age have died of pulmonary tuberculosis; and since 1955 no male under 25 has so died. This group which was second to the 25-34 age group from 1855 till 1934 for severity of attack dropped to third place then being replaced by group 35-44.

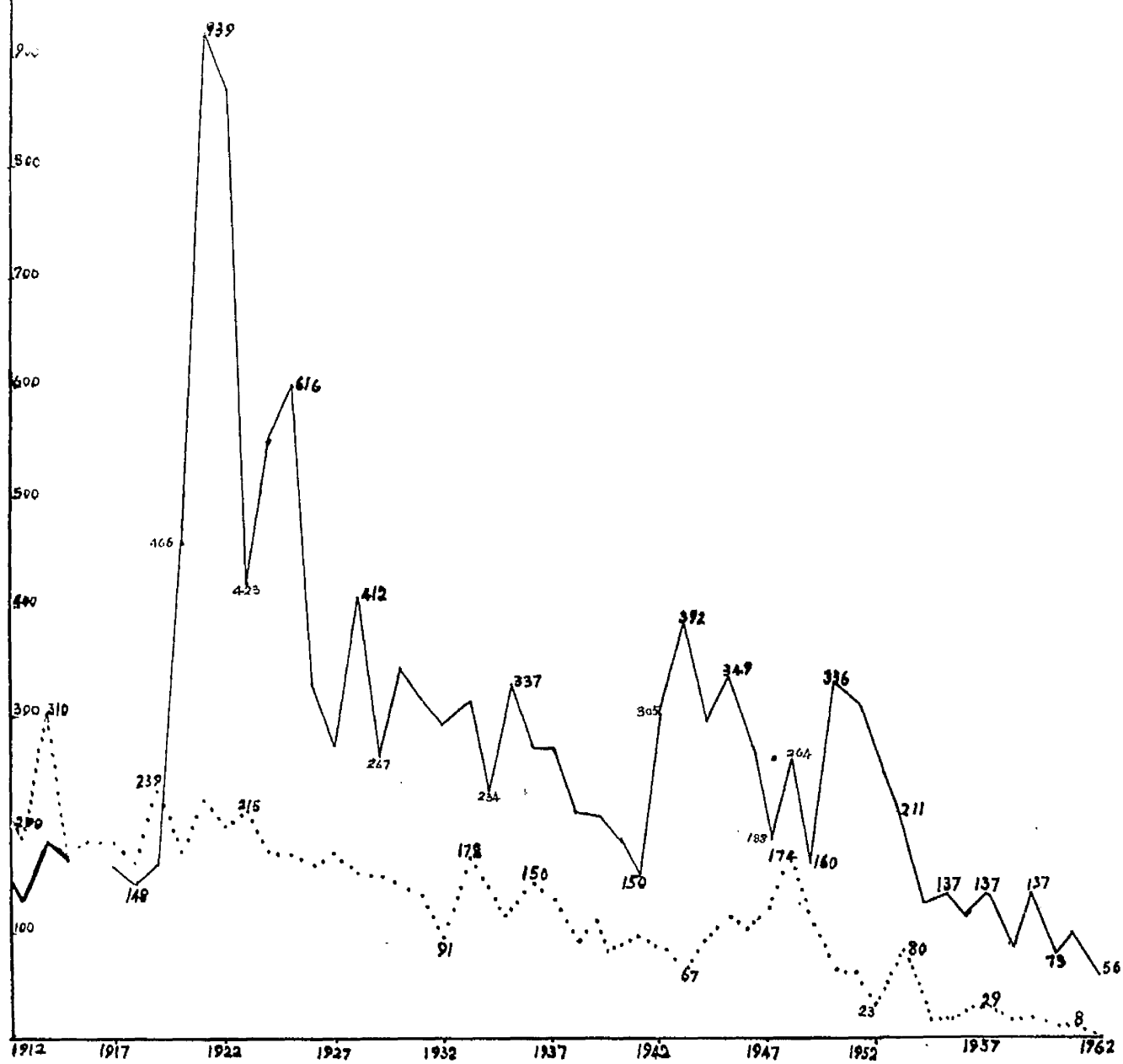
The older males have failed to keep pace with younger in the general decline and the 65+ least of all. It will be noticed that the 25-34 year olds had a set back in the 1925-34 decennium while its rate of reduction was again slowed in 1945-54. At this latter period the 15-24 age group deteriorated. The First World War told heavily on the 10-14 year olds and its mortality rate rose very considerably above its value in the "black" decennium. The School Medical Officer in her report for 1923 (as mentioned elsewhere) drew attention to the economic distress in the Island. However, from the table it is seen that this age group was coming more under attack, even before the War.

It was the 25-34 age group of the female sex which suffered most except during the decennium 1925-34 when the 15-24 age group took a huge leap to become 26 per cent worse than during the "black" decennium 1895-1904. From this decennium onwards the rate for young women did not show the same improvement as was taking place in the case of their brothers - the 15-24, 25-34, 35-44 age groups all show relatively higher rates than the corresponding male groups. Table IVa makes plain this retardation of betterment right down till the present. The 10-14 age group was showing a grossly increased rate before the advent of the First World War so that there was a lowering of the age at which phthisis was involving the younger females.

The charts made on the semi logarithmic scale give these results visually.

GRAPHS of TUBERCULOSIS STATISTICS for the ISLAND of LEWIS

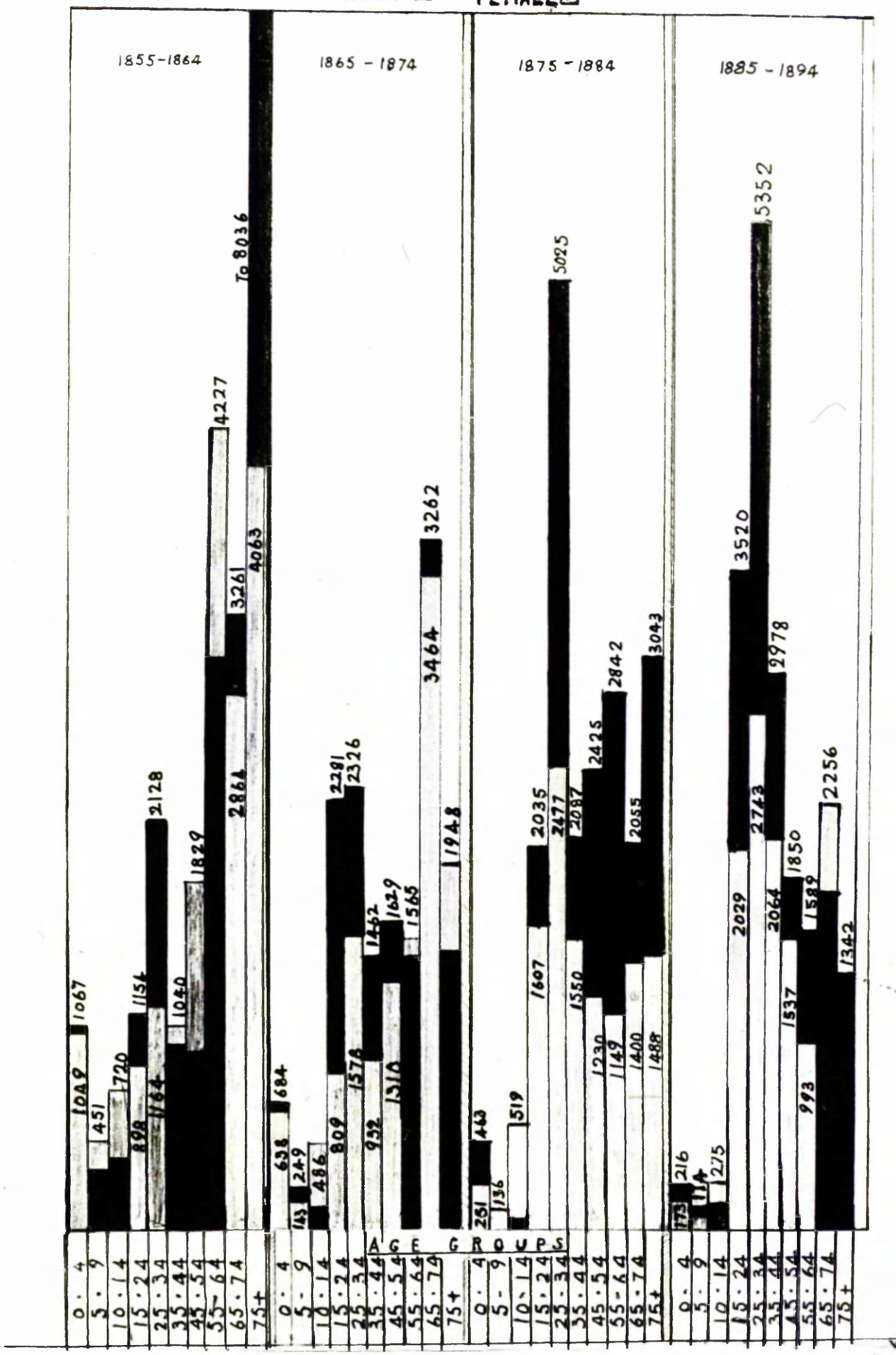
RATES per 100,000 LIVING — NOTIFICATION ——— (ALL FORMS)
DEATH .....



ISLE OF LEWIS

SEX-AGE SPECIFIC DEATH-RATES per MILLION from RESPIRATORY TUBERCULOSIS in DECENNIA

MALE ■ — FEMALE □



ISLE OF LEWIS

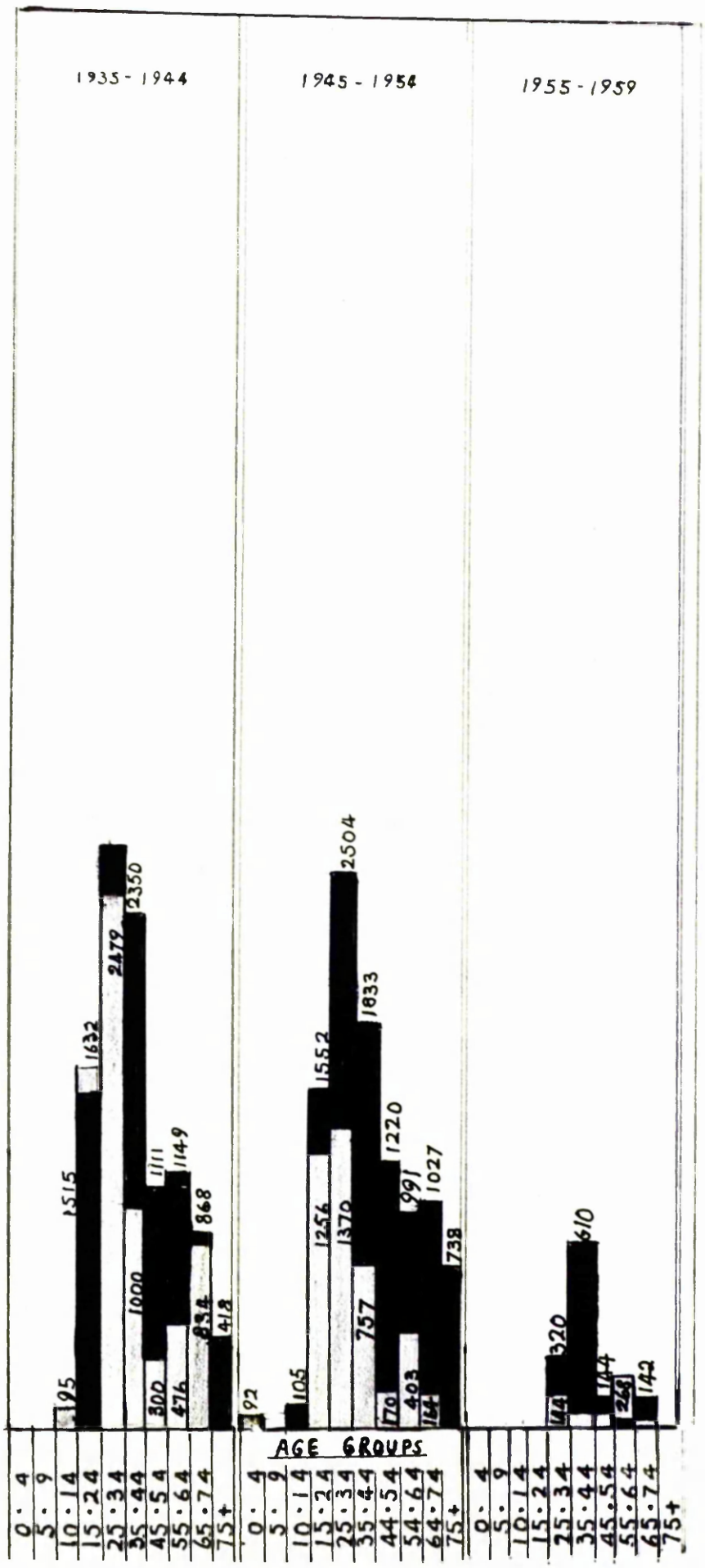
SEX-AGE SPECIFIC DEATH-RATES per MILLION from RESPIRATORY TUBERCULOSIS in DECENNIA

MALE ■ FEMALE □

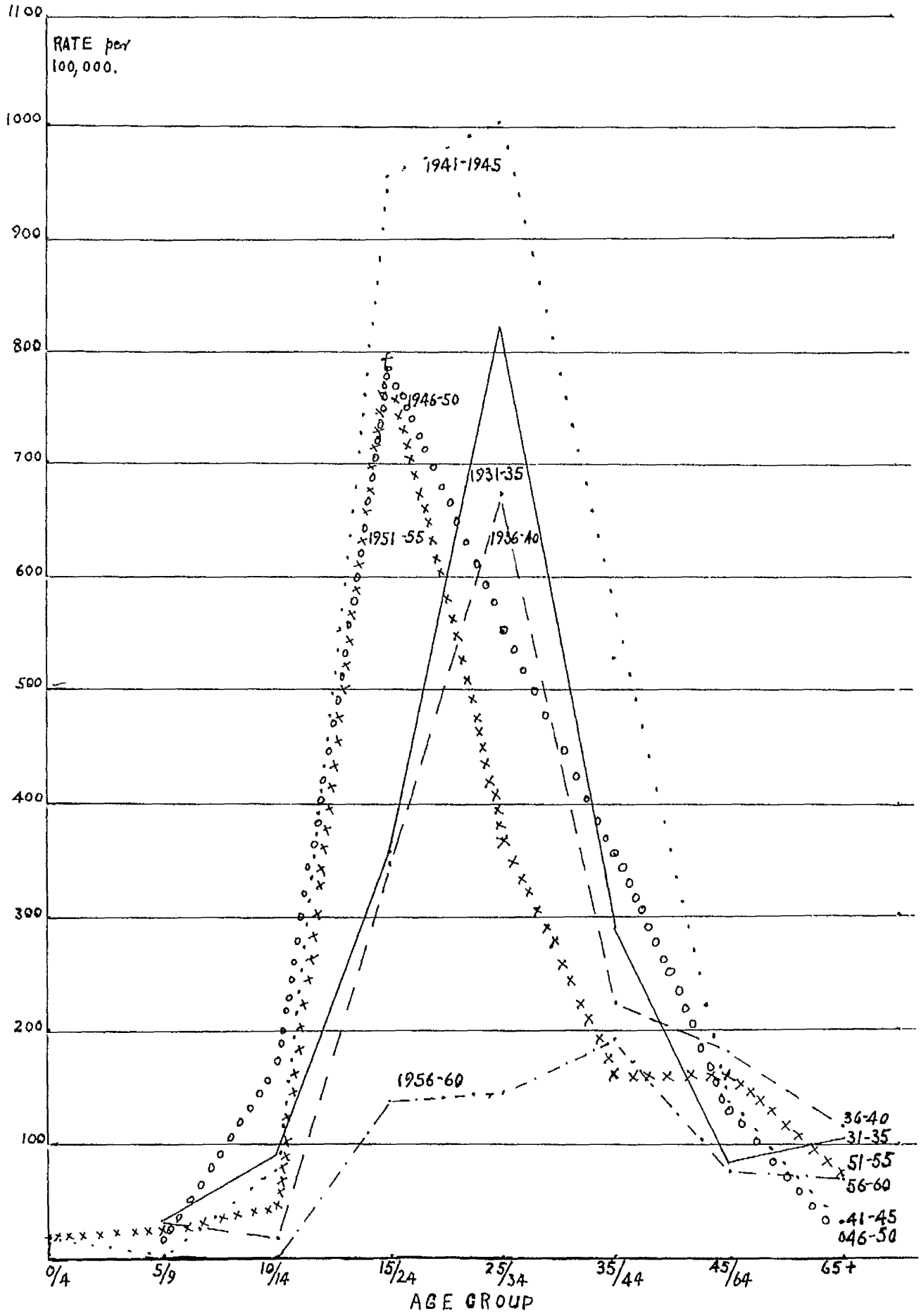
ISLE OF LEWIS

SEX-AGE SPECIFIC DEATH-RATES per MILLION from RESPIRATORY TUBERCULOSIS in DECENNIA

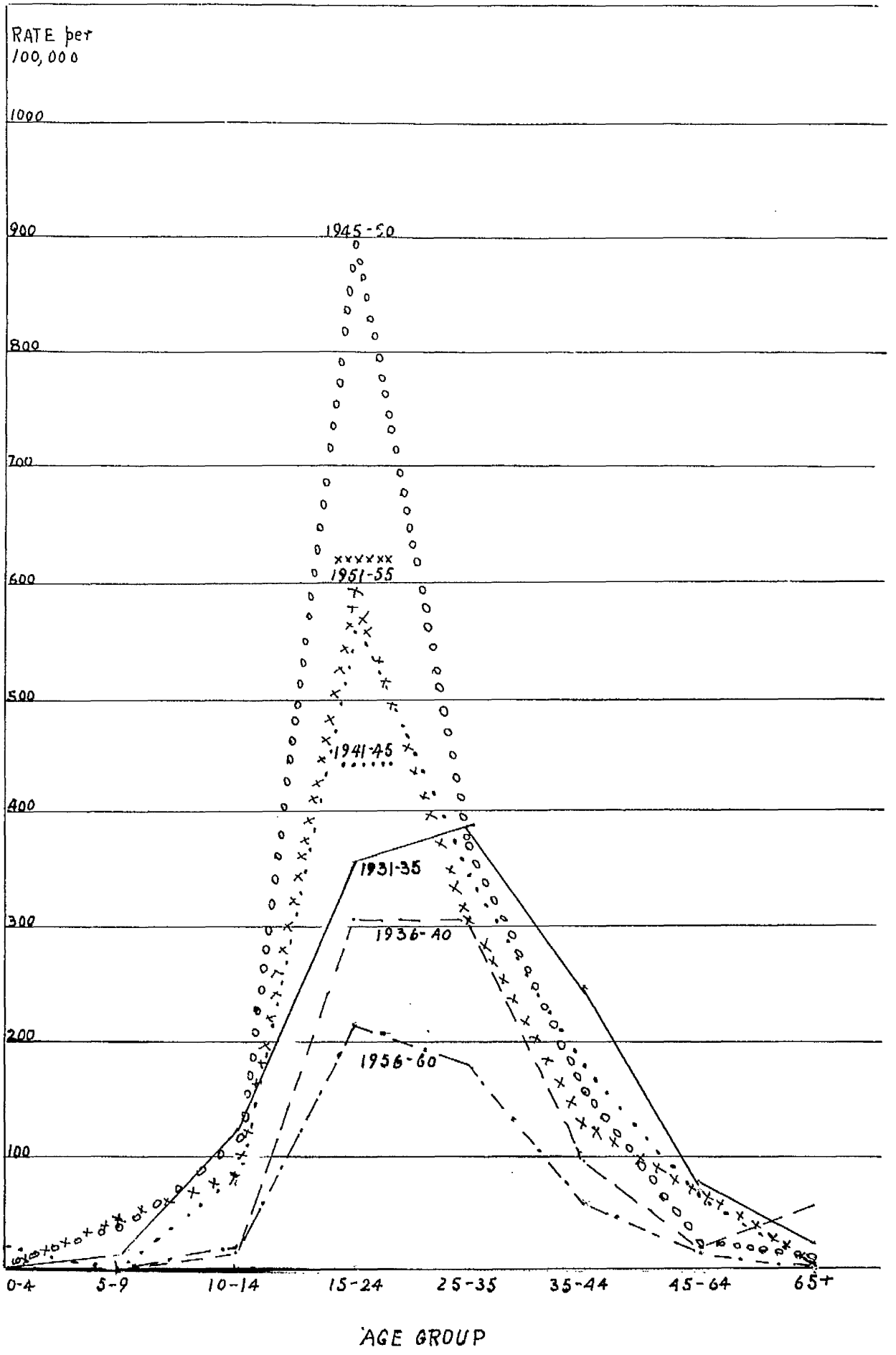
MALE ■ - FEMALE □



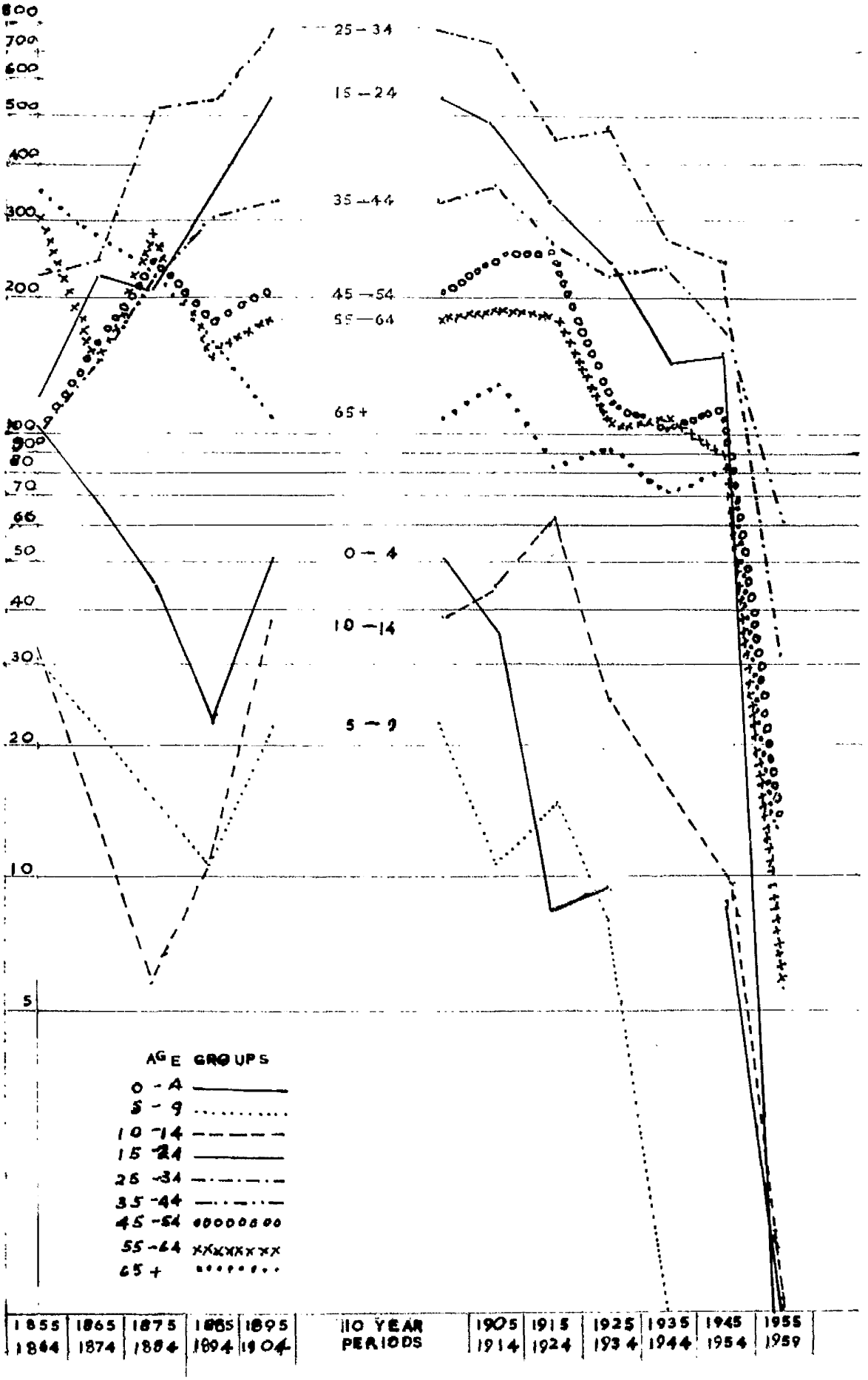
ANNUAL AVERAGE NOTIFICATION RATE for RESPIRATORY TUBERCULOSIS in MALES in AGE GROUPS for 5 YEAR PERIODS.



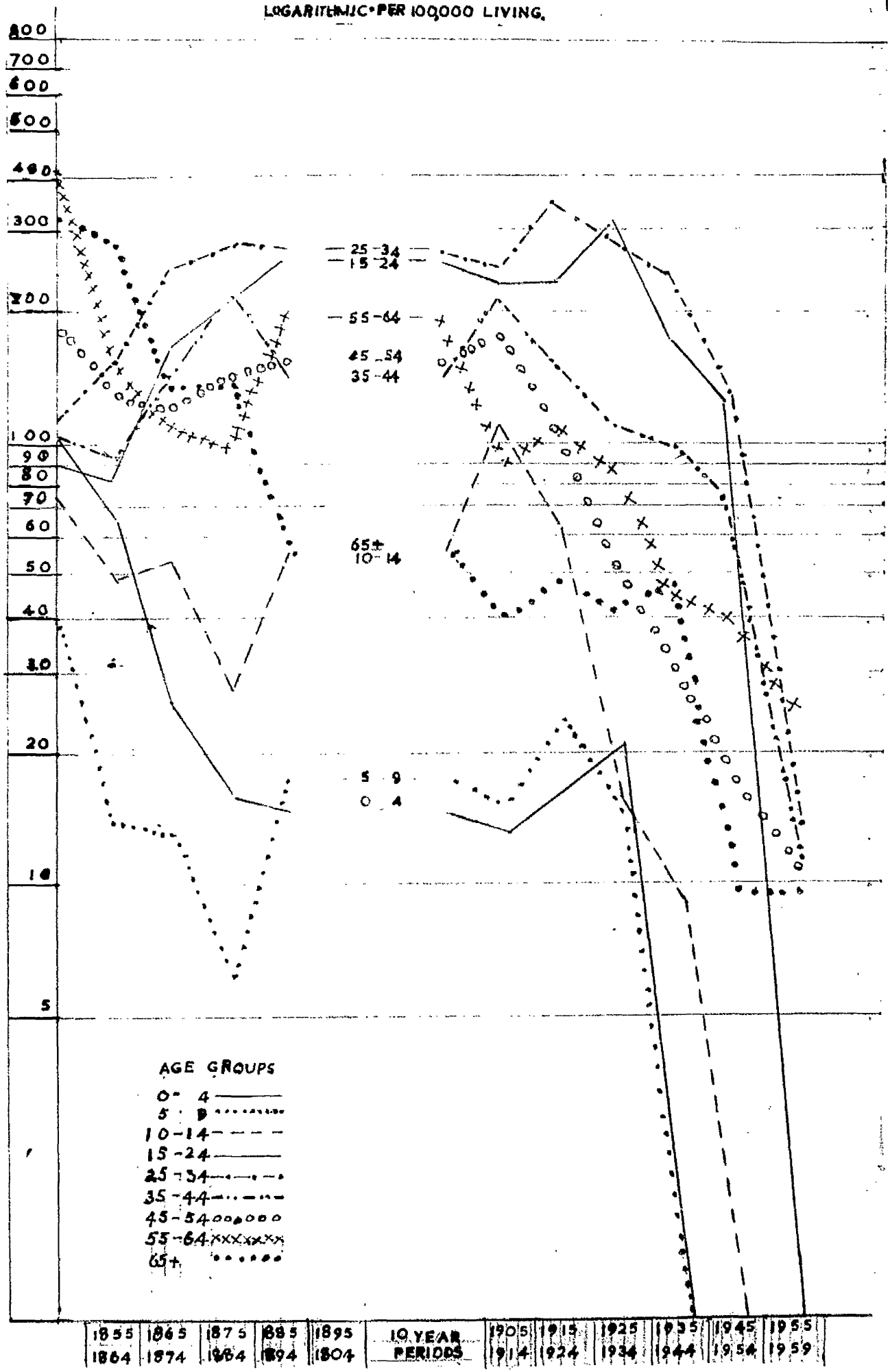
ANNUAL AVERAGE NOTIFICATION RATE for RESPIRATORY TUBERCULOSIS in FEMALES in AGE GROUPS for 5 YEAR PERIODS.



MALE RESPIRATORY TUBERCULOSIS DEATH-RATE FOR 10 YEAR PERIODS 1855-1959 — SEMI-LOGARITHMIC SCALE PER 100,000 LIVING

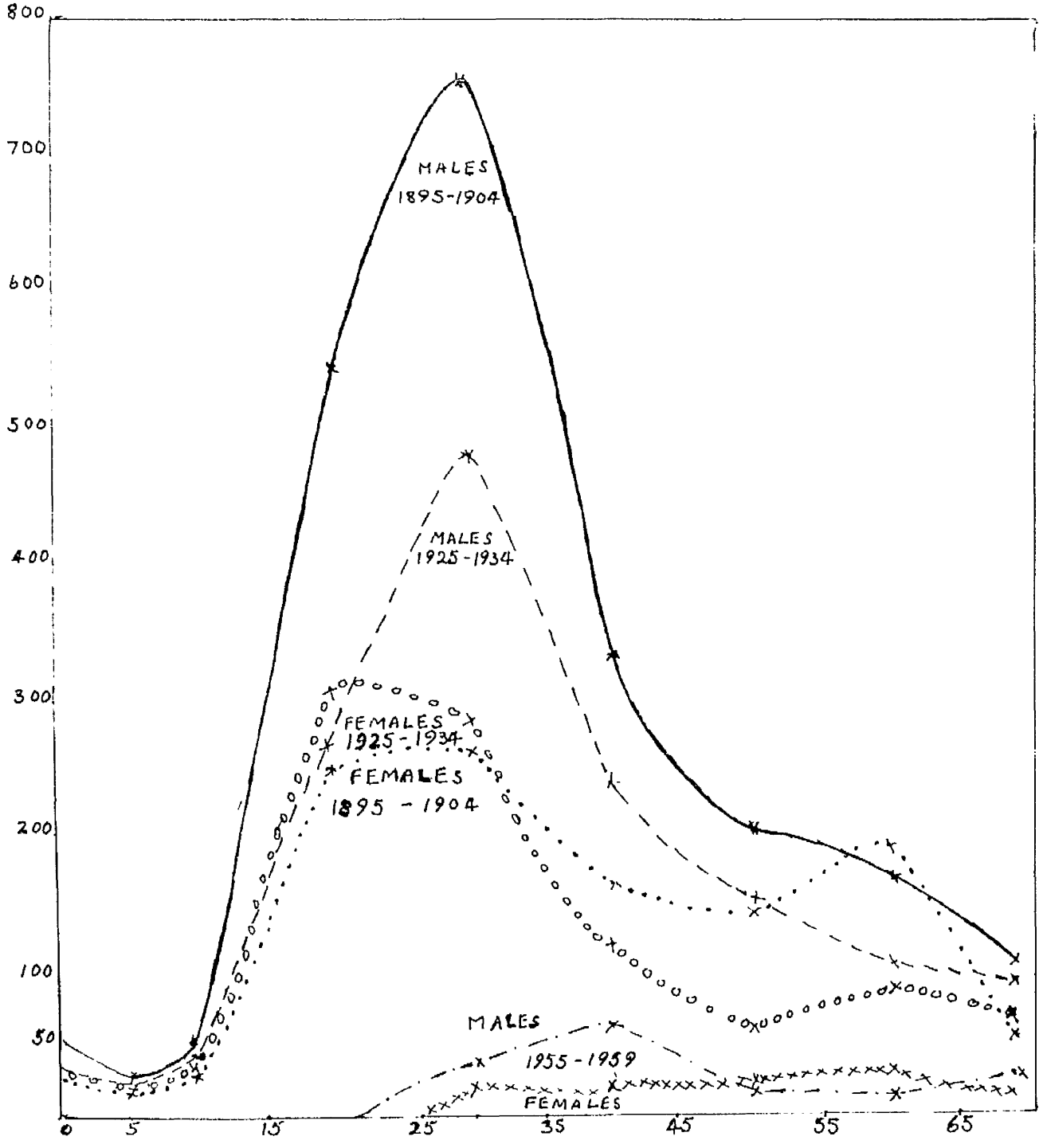


FEMALE RESPIRATORY TUBERCULOSIS DEATH-RATE FOR 10 YEAR PERIODS-1855-1959 SEMI-LOGARITHMIC-PER 100,000 LIVING.



AGE-SEX SPECIFIC DEATH-RATES for RESPIRATORY TUBERCULOSIS in the ISLE of LEWIS: the PEAK DECENNIUM 1895-1904 : the DECENNIUM 1925-1934 and the QUINQUENNIUM 1955-1959.

THE RATES ARE the ANNUAL AVERAGES and are per 10,000 LIVING.



Recent changes in Tuberculosis Incidence and Mortality in Scotland.

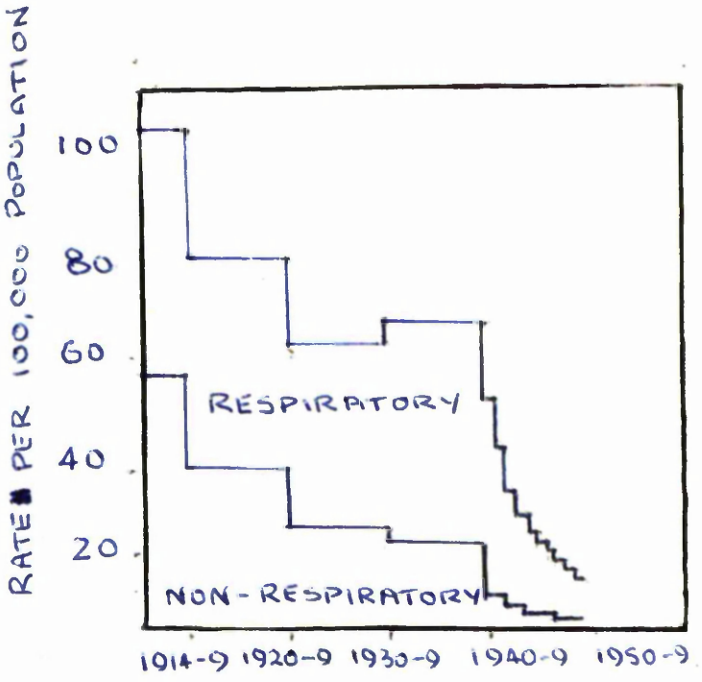


Fig. 1. Tuberculosis death rates in Scotland 1914-59; rates per 100,000 population.

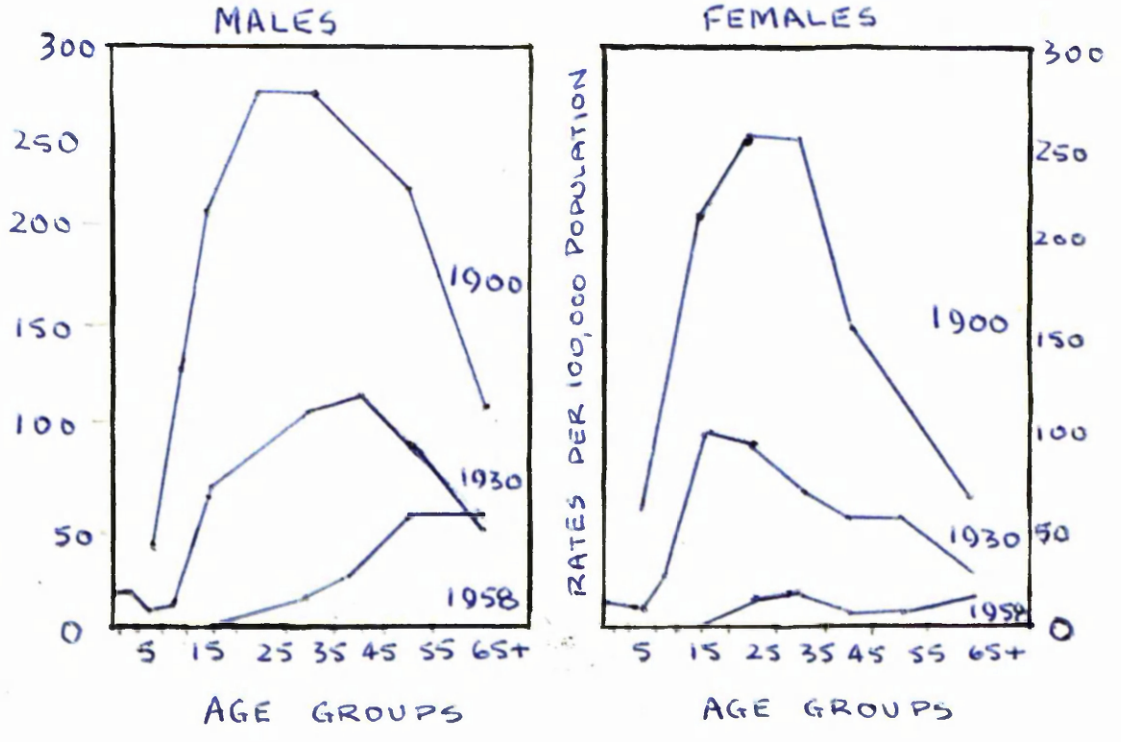
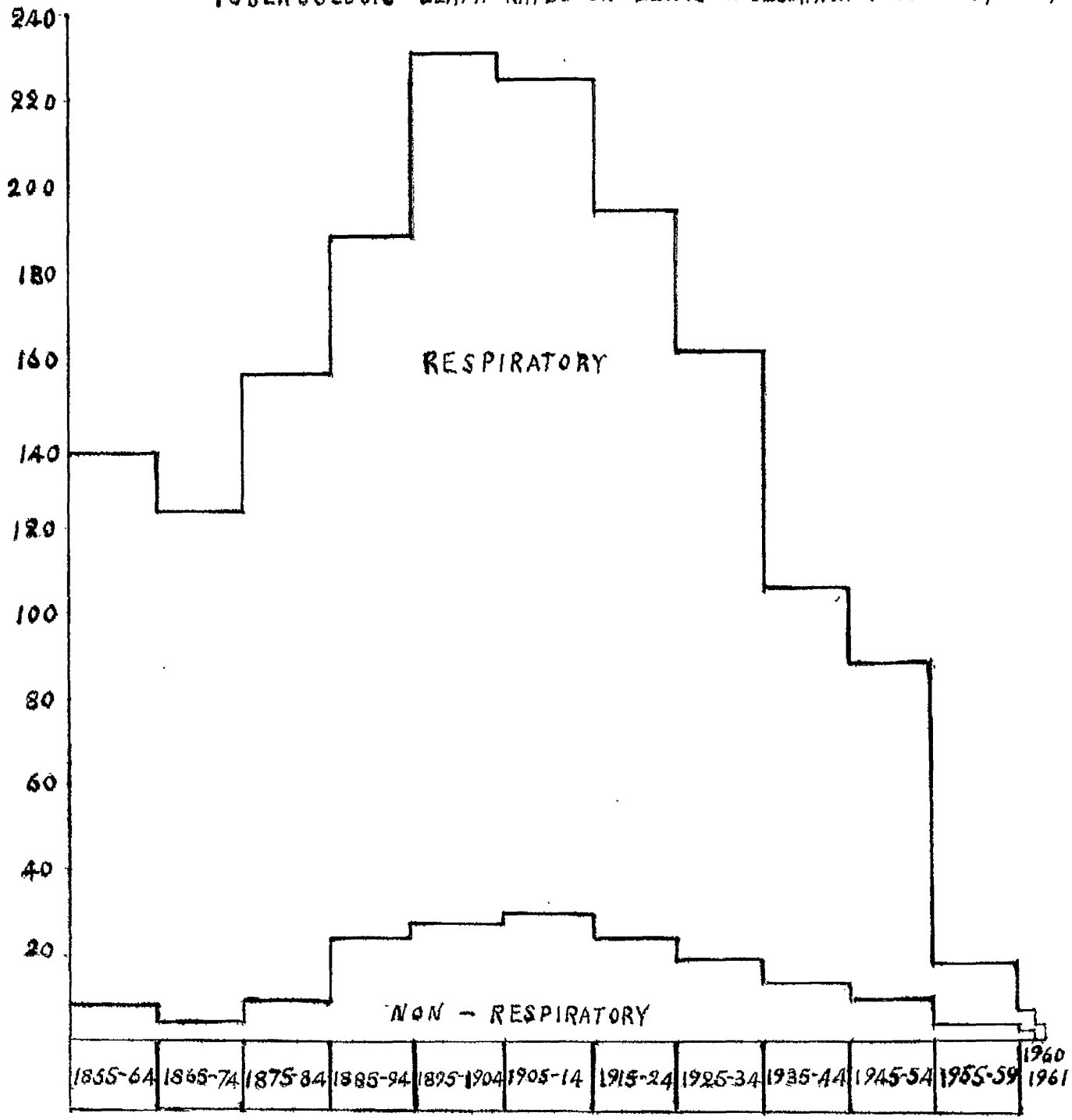
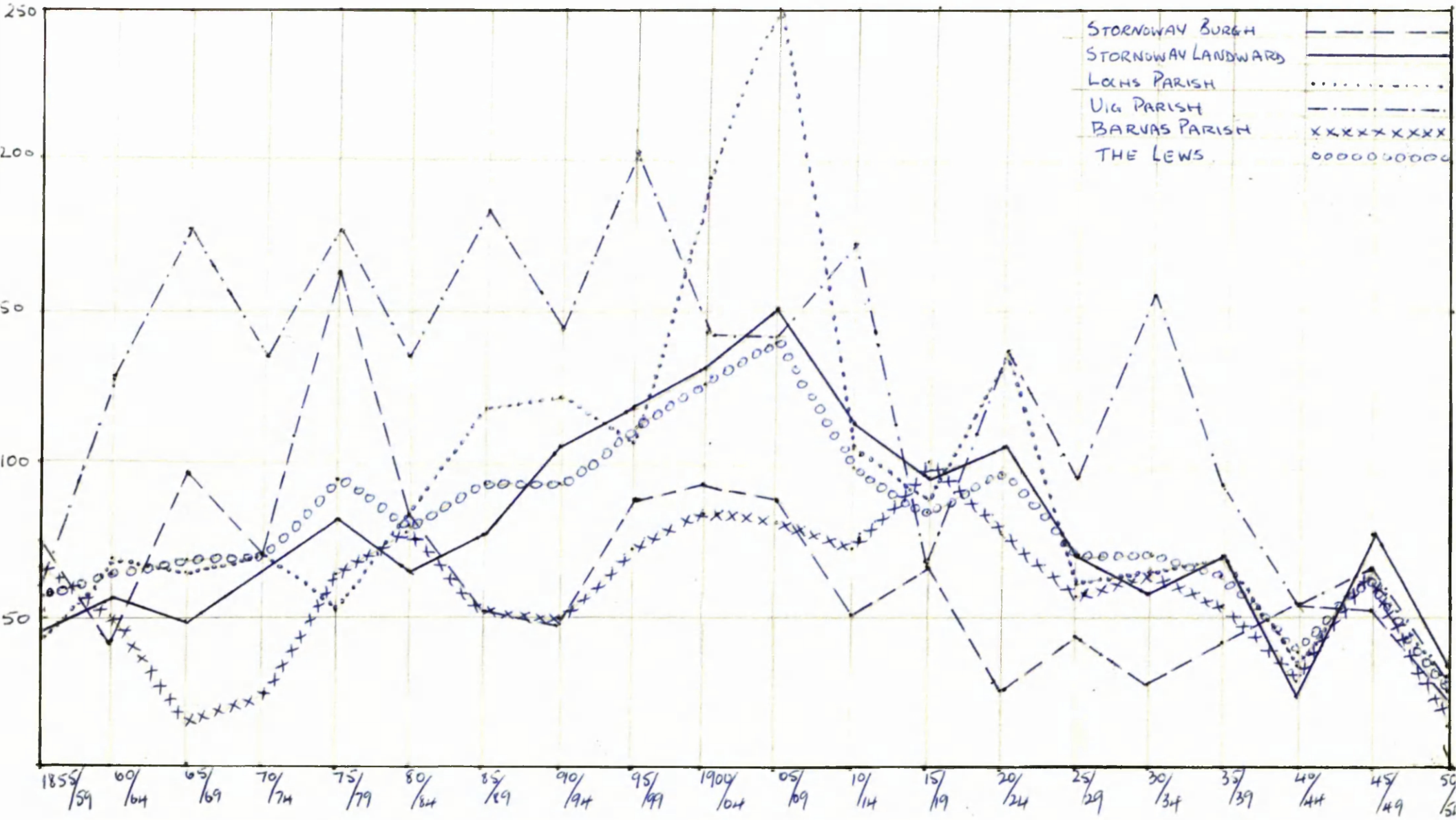


Fig. 2. Age and sex specific death rates for respiratory tuberculosis in Scotland 1900, 1930 and 1958.

TUBERCULOSIS DEATH-RATES in LEWIS in DECENNIA 1855-1962 per 100,000.



MALE PULMONARY TUBERCULOSIS DEATH RATES in the different PARISHES of THE LEWS



FEMALE PULMONARY TUBERCULOSIS DEATH RATES in the parishes of the LEWS.